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SUMMER PRUNING.

C. B. Luffmann, Principal, School of Horticulture and Small Farming, Burnley.

THE PRINCIPLES INVOLVED.

Fruit trees of all kinds yield the best average crops where their branches are thinned, stopped, or otherwise dealt with from year to year. Any cutting done whilst the head is leafless, or making no visible movement, tends to strengthen the tree, by reason of the same amount of root action as formerly expending its energy on a smaller number of branches. Further, new buds are possessed of greater energy than old ones, hence where sap forces their development, clean and direct channels are made for the passage of sap.

The amount of sap circulating in spring and summer, its character and distribution, as seen by the even or uneven growth of leaves and new wood, determines how far a tree may be thinned and stopped.

In every orchard of size, trees of various form, age, and condition exist, and no uniform way of pruning at any season may be adopted. Nor should pruning be carried out during one particular month, but always according to the year, and the individual capacity and demands of each tree. Irrespective of species or variety, where branches are far apart, little or no thinning of the leaves and young wood is necessary in summer, as over-exposure tends to burn both foliage and bark, devitalize the sap, dwarf and injure the quality of the fruit, and shorten the profitable life of the tree. Summer pruning is, therefore, most beneficial when carried out on strong trees, which have their main and secondary branches excessively crowded, and which provide insufficient light and air in motion to secure proper leaf development and ripening of the leaf-yielding wood.

Wherever trees of any kind are old and hard of bark, growing in exposed and hungry soils, or stagnant from any other cause, their leaves should not be reduced in number during the summer season. Summer pruning is helpful and most necessary to the young and the strong, since in the young it takes away such surplus growth as would interfere with the desired form, and encourages growth to fill up parts which might otherwise remain bare and profitless.

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It is possible to prune trees in winter only, and secure an even distribution of foliage and fruit, but it is invariably much more economical and sure to prune at both seasons, since the tree can be kept under control more by frequent than by infrequent handling. Further, summer pruning prevents labour of hand, and waste of energy on the part of the tree, whilst winter work invariably increases labour of hand, and adds to the unfruitfulness of the tree, that is, if not supported by summer work.

Summer work on trees may be carried out from the time leaves push out until they show sign of maturity in early autumn. Between these periods all the new wood of the year will be made. Fruit is borne on new or comparatively new wood only, and the size, chemical nature, and general health of the leaf determine the nature of the bud it will furnish. To keep trees growing, new leaves must be constantly unfolding, as wood does not extend after a leaf reaches maturity, so that where we desire to extend the size and vigour of young trees, they should not, as they would, be checked by summer pruning. Only in early spring and summer is it necessary to deal with young trees—rubbing off any buds which unfold in bad positions, as on the stem, or below where the main branches are desired, and a little later taking out the point of any extra strong shoot, so as to insure an equal growth to its neighbours.

To persistently pinch and stop young trees in summer shows complete ignorance of their wants, and must ever prove a misfortune to their owners.

The more leaves a plant can make and maintain, the more it will grow, and growth is all that is desired of the young and undeveloped tree. In a general way, young trees require hard winter pruning, and a little spring and early summer work in the way of thinning and stopping up to their third year. After this, if decidedly strong, they will require less cutting in winter, and this chiefly in the direction of spacing the branches to provide for the lighter fruit-yielding wood, and in spring and early summer such thinning as will provide space and full development of the requisite light wood. On the other hand, where a tree is weak, little or no spring or summer work is done, since every leaf is wanted to help on the circulation of the sap, without which the tree cannot survive long.

As trees come near to the bearing size, they demand more careful and frequent treatment in summer. An even crop of well formed, perfectly, and well-ripened leaves is required of all trees before they can yield even and good quality crops of leaves.

SAP MOVEMENT.

No one can for a moment presume to deal with trees in an exact way, who does not know the ordinary and extraordinary movements and variations of the sap. And this knowledge is particularly necessary when we come to summer pruning. In fact, trees should be pruned only in winter (if at all) where one's knowledge of their nature is decidedly limited.

When we cut or pinch a shoot very lightly in summer, it receives but a temporary check, and a bud from or near the leading leaf quickly pushes out and continues the lead. In such circumstances the inner nature of the shoot and the leaves it carries undergo but little change. Cut or pinch a little harder and the sap may stagnate, or force a strong new shoot, all depending on the period of summer, and the amount of moisture in the soil and the atmosphere. If dry and hot, feeble and fruitful growth will result from the hard cutting; if moist, "growing" weather, then the new growth

will be coarse, green, and impotent. In brief, if it were possible to cut or pinch to a certain length a shoot every day over three months of summer, it would yield different results from each daily operation; or, again, if we took a shoot 2 feet in length, and gradually reduced to within 1 or 2 inches of its base, it would, as a result of this varied treatment, produce equally varied results. Now, of course, these statements, are made only with the object of making the orchardist think before operating. It is pleasurable to know things, especially when they are the facts of nature, and it is only in so far as one knows how sap changes in volume and quality at different seasons and positions in trees that he may be said to possess a safe working knowledge.

THE SIZE AND VARYING FUNCTION OF LEAVES.

No shoot or spur has leaves of equal age, nature and opportunity. Those at the base of the shoot or spur are the oldest and the weakest; those at the extreme point of a shoot seldom develop to the extent that they yield true flower-forming sap, and this is why so few shoots bear fruit or fruit buds.

The leaves which unfold during early and midsummer are the most complete and capable; they are formed out of more or less elaborated sap, and have the advantage of a dry and powerful heat; hence the buds they yield are more capable of yielding flowers than are those formed at any other period of summer.

Leaves should be studied both individually and collectively as they exist on any tree, in order that the proper check may be given, and change effected in the subsequent growth.

THE DIVISIONS OF THE WORK.

To get the best average results, summer pruning should be practised at three periods. In spring and early summer to sweep away any excessive buds or shoots, which would, if allowed to stand, choke the desired leaves and the buds expected of them. Later on—in December or January—according to season, region and vigour of tree, more thinning will be beneficial, and also the stopping of stray shoots, or, in the case of the apple converting shoots into spurs, since this check during the hottest period of the year invariably suspends the circulation of the sap, changes it chemically, puts additional pressure on the light wood which has been left, and thereby forces a weak new growth, which, more ripe in nature than the earlier growth, forms flower buds where dormant or active wood buds would otherwise appear.

Where spurs are made, a leaf or two must always remain at their ends, otherwise they will die through the sap having no power of rising to a leafless and budless point.

Towards autumn, normally in March and April, healthy bearing trees make more growth, which, if allowed to stand, overwhelms the leaves and buds made earlier in the year.

Late summer growth should, therefore, be removed outright from all mature trees, as its presence works injury in many ways. In the first place, the early or main crop of leaves must have room to ripen themselves and the wood whence they spring. Next, the late growth, if allowed to stand, adulterates, weakens, or overlays the original deposit of sap, so that flower

buds are less liable to become perfect and develop fruit; and, further, the action of the root is disturbed to the extent that it has less power of supplying the class of sap to which fruit buds look for sustenance and support.

LIGHT AND FRUIT BEARING.

When the outsides of trees fail to carry fruit, it is usually because the wood has not had time to thoroughly mature, and thereby secrete the sap, out of which the flower buds and fruit are made; thus there may be an abundance of light, and yet no possibility of fruit on really young wood. But on the inside of trees the light is rarely sufficient to develop perfect leaves, and unless perfectly formed and well ripened leaves are secured, fruiting must be limited to the best lighted and most mature of the young wood. Remember that the good leaves in one part of a tree have no power to improve the quality of those in another part. All leaves are liable to rob each other by shutting out either light or air, but they can never pass on ripe sap or such elements as may be wanted by those struggling to exist in deep shade. Each piece of wood must, therefore, be given direct access to light and air in motion. The fruitgrower should always bear in mind that he is at one and the same time dealing with at least two crops. He has the fruit on the tree, which must be well developed by means of healthy leaves; and he has also to consider that the number, size, substance, and degree of ripeness in these leaves determine the nature of next year's fruit crop. Leaves must be abundant and strong enough to pull up plenty of sap, with which to feed the present crop, but not so strong and crude in character, or so densely packed, that they cannot ripen and provide the desired class of buds for next year. Midsummer is the time to thin such trees as apples and pears, which are in bearing; the stronger and more dense the foliage the more it should be thinned. Before one can thin with safety he must be able to judge if a tree is really strong or otherwise. All free growing trees are not over strong, and to thin such as are at all sensitive may work serious injury, but to those who can form a right estimate of the vitality and wants of different trees, there can be no better time than the early half of December for letting in a broken light to all parts of the head.

YOUNG TREES TO BE DEALT WITH IN SPRING ONLY.

The object of summer work on young trees is mainly to direct growth where it is wanted, and to take away such growth as would spoil the desired form.

Trees from one to four years should never be touched after November as the more leaves they carry the stronger they will grow, and with a good root and trunk system, it is easy and safe to cut the head into shape by winter pruning.

Not until a tree is distinctly large and strong enough to bear fruit, should it have its leaves reduced by either pinching or thinning in midsummer.

THE ECONOMY OF SUMMER WORK.

This is indisputable. It is cheaper in the matter of labour. It produces more certain and profitable results. Its effects are more lasting, in that a tree which is once or twice summer-pruned with intelligence, can be made to fruit over a great number of years, at little or no expense in the way of winter pruning.

Soil lasts longer owing to growth being less rampant. Fruit is more uniform in size, colour, and quality. Summer pruned trees produce the hardest and best keeping fruit.

Against summer pruning it must be said, that in damp and screened positions, black spot and other leaf diseases are liable to increase, since the second crop of young leaves may fall an easy prey to fungi. Woolly aphis also attacks all wounds in soft wood, as they occur in summer, so that it is necessary to spray and otherwise cleanse trees thoroughly whenever these pests are liable to occur.

THE REGION AND SEASON AS THEY AFFECT SUMMER WORK.

After a long dry summer, or loss of foliage and vitality, produced by over-cropping, storms or pests of any kind, trees require to increase their root range, and this they are unable to do if their foliage is seriously reduced in the summer following the strain. So it follows that where the soil is consistently and persistently favourable to root growth, summer pruning will be much more necessary than where, from excessive heat and drought, root growth is irregular, and always limited to a few months of each year. The capable orchardist will at once observe that summer thinning and stopping must always be in agreement with the natural or desired vigour of the roots.

In some positions summer work may be done with the sole object of steadying the roots and preventing the growth of crowding wood, whilst in others it may be necessary to save wood already made, air and direct sunlight being more or less necessary to all leaves when they are called upon to yield flower buds, or perfect fruit.

SUMMER PRUNING FOR FRUIT.

December is on the whole the best time of the year to commence thinning and shortening the shoots of apples and pears which are not supplied with a sufficient quantity of bearing spurs. The warmer the climate the shorter the period required to make and ripen fruitful wood, and as no two kinds of tree, nor any two seasons are exactly the same, it follows that no absolute time can be named nor amount of thinning decided upon to serve all trees, districts, or seasons.

Pears take longer to form and ripen wood than do apples, and again some apples may respond admirably to summer pruning, while others, especially if weak, would be injured by the practice.

To insure success in the work, first see that the tree has more leaves in some parts than it can bring to perfection, or that wads and masses may be screening other parts, and thereby run bare. Thinning alone may be sufficient for some trees, whilst others, after they have been thinned, should have some of the shoots cut back to two or more leaves, according to their strength and the opportunity existing in the way of space. The stronger the tree the further apart its leaves should be arranged, so as to allow a fair amount of sunlight to play upon the heavy wood. All spurs must be given two or more leaves, otherwise they are liable to die through the leafless stump having little or no power to draw up sap and furnish new growth.

On the whole, thinning and stopping are best for apples, but pears make spurs freely after being well thinned towards the end of December and throughout January. In very strong trees the weakest, or at least, moderately weak and spreading shoots or spurs, should be striven for, whilst trees of weaker growth need stouter and more upright wood to insure free fruiting. Once a tree has borne fruit it is an easy matter to discover what type of wood has borne most freely, and this seen, summer work is easy and sure, always providing that the resources of the season and general condition of the tree can be accurately estimated.

SUMMER WORK ON APRICOT TREES.

Apricot wood takes a long time to ripen, and, excepting in the warmer districts, it is unwise to do any stopping or converting shoots into spurs during summer. Excellent results invariably follow hand thinning, or what may be called disbudding, of apricots during early spring. This work should be taken in hand before the young shoots toughen, as then they break away easily, and cause no serious wounds or loss of energy, whilst more room is afforded for the desired shoots and spurs. To thin or in any way reduce the foliage during the growing of the crop is to reduce its size and value, and so further thinning has to be left till the end of December and through January. As we have said, cutting back is inadvisable, for even though it leads to a second growth which will yield fruit in the hot north, it is at the expense of a great deal of bare space in the lower part of the tree, besides which its general vitality and length of profitable life is considerably reduced. Midsummer work on apricots should therefore be limited to thinning out the crowded tops, and also such inside growth as prevents the ripening of such leaves and wood as are expected to yield fruit in the near future.

THE MODE OF THINNING.

Since it is ever desirable to make each tree bear throughout its entire head, it follows that checks as by thinning of shoots and leaves should take place at such points and seasons as will force new growth on any bare parts low down and inside the tree. The leading shoots and wads formed at elbows or sharp curves of branches are therefore the points at which one reduces the activity of the sap.

What is superfluous should be taken away altogether. It is a silly and costly method that of snapping and leaving shoots, no matter what is expected of them, for they cannot fail to produce injurious shade and temporary loss to certain parts, besides which they encourage insects and disease, and put the owner to the expense of cutting them away in winter. When a man breaks a branch and leaves it, he at once admits his ignorance of the wood he is dealing with. To be sure it may come into fruit, but that is nothing if it can be made to do so by cheaper, cleaner, and safer means.

But we are here dealing with thinning, and its objects are to provide leaves where none exist, to give more light and air to those existing, to direct and control the size, shape, and substance of the various parts of the tree as a whole, to give as far as possible a set space and character to the sap, since we have it in our power to alter sap so that it will in autumn provide wood or fruit buds as we may desire.

The various sizes of shoots, their position in the tree, and the age and character of the wood whence they spring, determine their inner nature, and what they can in time furnish; as other wood, or flower, and fruit. Thus in cool and shady soils and positions, trees are inclined to grow more wood than is necessary, and flower and fruit but shyly, or, perhaps, show a great deal of impotent or imperfect flower. This may arise from excessive crudeness of the sap.

Light on the leaves may bring about a free setting, but usually such a soil must itself receive additional light and air; and so when we come to thin trees, we must not think of the head or even the offending shoots alone. We need to know all the materials and influences which have gone to make the tree before we can rightly determine how, when, and where to thin its foliage, or in any way reduce its vigour.

THINNING STRONG TREES.

All strong apples and pears, which are carrying tufts of wood, where no more than a single shoot is necessary, should be thinned in December. With the hand, break or pinch away the excessive shoots, leaving some with a leafy spur when they are seen to be desirable. In vigorous trees, the most important work is in their tops, thinning the extremities of each leading branch, so as to make the sap burst into growth lower down, and thereby furnish all the body of the tree with light fruiting wood. Do not pinch or in any way thin weak trees, as they need all the leaves they possess, even though these may be in faulty positions. Weak trees need hard cutting in winter, whereas strong and unfruitful trees are made profitable by judicious thinning and stopping in summer. Trees which are thinned in early spring will not call for further attention till the middle or end of January, after which time it is unsafe to promote spur growth, as insufficient time is left for its ripening before the fall.

THE MODE OF STOPPING.

Stopping is the term applied to pinching or cutting back such shoots as are desired, though not in their entirety, and for these reasons:—As long shoots there may be insufficient room for their proper leaf development; they would create shade and barrenness, and, further, in some sorts of trees they would not, as shoots, promptly yield fruit; so for some one or more of these reasons they are cut or pinched back. This stopping causes more or less stagnation of the sap, the heated atmosphere withdraws the watery properties, the sap therefore changes, and what we term ripens rapidly. From this more or less ripened sap new leaves come forth, they cannot develop into coarse wood-forming leaves since it is midsummer time and moisture is scarce, hence they grow slowly, and gather the flower-bud making properties from all they imbibe from atmosphere and soil.

Whilst it is easy to explain the natural process of bud formation for any purpose, it is difficult to convey an idea of the extremely varied results which come from miscalculating the powers of leaves and trees, and the influences at work in different periods of summer.

Thus if two pieces of wood of exactly the same age, size, and general appearance are growing one at the top and one at the bottom, or one on the sunlit outside, and the other on the sunless and airless inside of the tree, and these two pieces of wood are pruned or stopped in the same

way, and at the same time, the growth which results from them will be in every way different both in appearance and value. And this, because a healthy tree is in no sense like a healthy animal equally vital and capable in all its parts. The selection of wood is, therefore, of the first importance.

In an extra strong tree, the weakest wood is likely to be most capable of fruit-bearing, whilst in a weak tree the stoutest of the season's shoots may not be too strong to yield fruit. Then the well-placed and most upright will be the strongest and most woody where the lateral and dependent shoots will be smallest and yet ripest, always providing they have developed in plenty of sunlight and air in motion.

Taking any full-grown tree, as an apple or pear, it may be necessary to stop shoots at every possible length between two inches and two feet; thus some will be converted into "spurs," whilst other shoots will be no more than tipped. And the reasons for this varied treatment? They are as vast as the number of shoots to be dealt with. Each is an individual quantity occupying a unique position, and calls for peculiar treatment if we are to at once make it yield fruit and fix its task.

Time involved in the Formation, Growing, and Ripening of Wood of Different Species and Varieties.

Seasons, soils, situations, and vigour of trees alter so much as to render it impossible to state an exact time as necessary to the growth and perfecting of a piece of fruiting wood.

Thus a strong tree, in a favorable season, may make useful wood in half the time which would be employed by a weak tree, or a "slow" season.

Since we desire "ripe" wood only for fruit bearing, midsummer pruning is the most favorable to its production—December to end of January in Victoria—but in cooler parts it may be done as early as November, whilst in hotter regions it may be practised as late as the end of February (peaches only).

Of all fruits the peach forms and ripens its bearing wood in the shortest time—In really hot regions in from nine to twelve weeks; in average Victorian conditions in from eleven to fourteen weeks; in cooler regions from fourteen to eighteen weeks. Knowing the ordinary period of "fall," and observing the vigour of the trees together with the behaviour of the season, furnishes a clue as to the time when the trees should be thinned and stopped in order to secure fruiting wood. This, of course, applies to all trees.

Apricots in hot regions endure stopping immediately after the fruit is taken, but in a general way it pays best to limit summer work to thinning during December and January.

Pears and apples are the two fruits which pay best for systematic thinning and stopping in summer, but as their vigour and condition vary, so must the treatment. Trees bearing freely should be very lightly pruned or left alone.

Some pears make fruitful wood in a short period, but as a rule they require from eighteen to twenty-four weeks to form a perfect wood. Therefore stopping (which, of course, promotes new growth), should not be done after December, whilst in cool regions November is quite late enough to do the work.

Thinning may, with advantage, be done whenever leaves are seen to be crowded, as light is a constant necessity where flowering wood is sought.

Once a tree has borne fruit, its bearing type of wood is easily seen, and, of course, any summer work should be done on wood which will secure the development of wood of the right size. (If fruit is borne on wood of different sizes and qualities, it also will vary, and it is from failure to observe this rule that so much irregular fruit appears.)

Apples average a slightly shorter time than pears, thus they make useful wood in from twelve to twenty weeks. Of course, the better the position, the shorter the time involved in ripening wood.

In cutting wood of different sizes and angles of growth, different lengths and numbers of leaves must be given. Thus an upright piece of wood, in a central position, can draw up more sap, and make stronger growth with two or three leaves than can a shoot carrying six or eight leaves in a side or horizontal position.

Again, shoots or spurs formed at the base of branches need to be of two or three times the substance of those selected at the top or leading points of the tree.

Short-jointed and firm, well-coloured shoots should always be selected for treatment, and such as are "drawn" have usually small and thin pale leaves, which should not be pinched back, but left alone or removed outright, if they are superfluous.

Where summer pruning is taken in hand, notes should be made of all the varieties dealt with, and the seasons at which they are treated. The following winter will reveal the results, and thereby give a fair idea of the seasonable requirements of each kind.

CLOSER SETTLEMENT STUDIES.

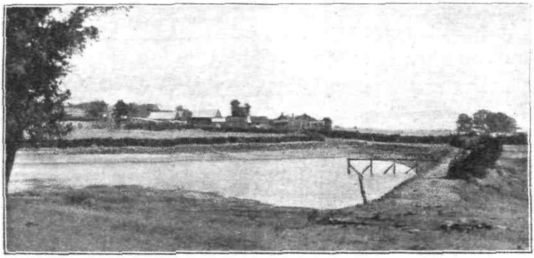
AROUND THE GOLD-FIELDS, No. 1.

A. S. Kenyon, C.E.

The land around our gold-fields was rarely available for settlement under the ordinary conditions of selection, and consequently is held, if at all, in small areas. Speaking generally, its quality is of the poorest, and for the most part there is almost an entire absence of surface soil. Clay closely resting upon the silurian—or rather in more modern terminology, the lower Ordovician—slates and sandstones, and containing much shingle and angular quartz gravel is the rule. Nor does the natural vegetation appear more inviting—Eucalyptus saplings and suckers, scrubby black wattle, broom brush, and other shrubs, with some scanty and inferior grass form the general surroundings of our reefing fields. Yet amongst them numerous examples of what labour and intelligence can do with small areas of inferior land are readily found. Needless to say that, with the conditions given, irrigation is almost always the principal factor in success.

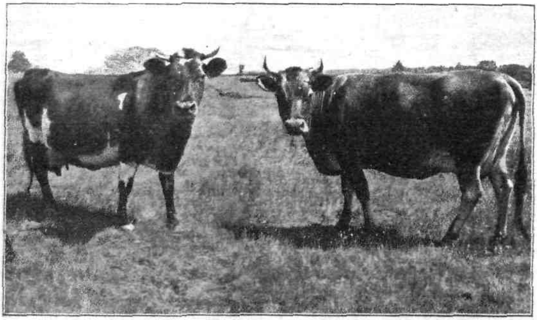
At Stawell, just behind Big Hill, is a small farm where irrigation from gully dams has been practised for a quarter of a century. Dams of considerable capacity—one of three, another of one million gallons, as well as a smaller one—have been constructed on a gully running down

from the Big Hill through the property. Outlets in the bank at different levels are made with piping, and from them a complete system of small



GULLY DAM.

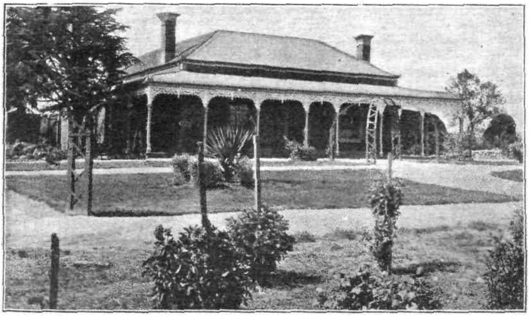
channels irrigates the pastures. The chief source of revenue was milk sold on the farm, though in times of drought, before the installation of a reticulation in the township, a considerable profit was made from the sale of water itself. Since the death, a short time ago, of the original owner, the farm has not been worked to the same extent. The profits resulting from the factors, water conservation and dairying, may be judged from



TWO OF THE MILKERS.

the photograph of the residence on the farm. Just below, Mr. Sargentson and his son hold 6 acres under garden licence. Inspired by his neighbour's example, Mr. Sargentson—an old miner whom the local depression in mining had thrown out of employment—built a dam a few hundred yards above his land. Some 4 acres are laid down in strawberries, tomatoes, and general vegetables. The dam is much too small for requirements, and Mr. Sargentson intends constructing another of much

greater capacity. Yet, with the present one, capable of putting only some 3 inches in depth of water at the outside over the ground, a very fair living is made, while the certainty of even greater returns has been acquired. Even after a most exceptionally dry season, and at such a late period as February, strawberries still were on the plants, and the generally flourishing appearance of the garden was a striking contrast to the uninviting country around. Where a goat of the most enterprising character would have failed to secure its living, man can make enough profit to maintain a family. Mr. Sargentson also crops some 10 acres of oats, and has some fruit trees in an adjoining freehold of 40 acres. These are not irrigated, and the profit from them is very small. In another part of



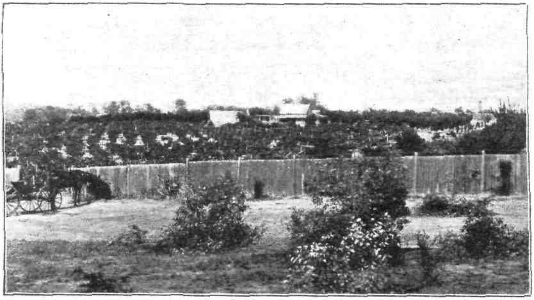
THE HOMESTEAD.

the town, close to the railway station, and surrounded by dwellings, an acre of tomatoes has been cultivated with remarkable results. Water is obtained from the mains at a cost of one shilling per thousand gallons, and as much as £15 per annum is paid for it. This sounds high, but the total depth of watering would be not much over 14 inches; off this acre, some 20 tons of fruit are produced annually. The soil has been to a large extent made artificially. Soil from gullies, refuse from wood heaps and from similar sources have been called into service. Large quantities of stable manure, blood manure, and bonedust are used. The system of culture adopted is principally staking with some trellising. The rows are 4 feet apart, and the plants 3 feet apart in the rows. Planting is done in October, no special effort being made to get early results. Boys are employed occasionally to stake and tie up, and pick the fruit. A fair proportion is made into sauce when prices are low. On some parts of the block, tomatoes have been continuously grown for eighteen years without any evidence of exhaustion. It is clear that the manures used supply the various constituents removed by the plant.

At Bendigo, Mr. Cumming's Flora Hill dairy farm has been already described in the Journal.* Within sight of it, there are numerous

* Closer Settlement Studies, No. 1, Dr. Cherry, p. 111, March, 1905.

examples of intense culture—not all long established, many being of very recent date. On Solomon's Hill, just below the Solomon's Gully reservoir and race, is a 10-acre orchard belonging to Sir John Quick, and managed by Mr. A. W. Potter. There are two blocks, one of 7 and one of 3 acres, separated by a road. On the 3-acre block there are planted one and a-half acres of pears, and nearly the same area of peaches. The land was broken up by contract; one half-acre trenched 2 feet deep and manured; the remainder ploughed 11 inches deep, all stones picked up, harrowed, and graded at a cost of £8 per acre. One hundred and eighty trees were planted to the acre. The trees have only been planted two years, and are, of course, not yet giving returns. Crops are, however, being gathered between the rows. Except for some asparagus, to be ready for cutting next season, the spaces between the pear trees are devoted to peas and tomatoes. Last season the peas gave a return of £11 per acre, and were ploughed in afterwards as green



SOLOMON'S HILL ORCHARD.

manure. Two hundredweight of Thomas' phosphate were used with the peas and two waterings were given. The season after peas have been grown, tomatoes are put in as a rotation crop. Tomatoes yield about 400 cases of 40 lbs. each per acre. An average price of about two shillings per case is obtained—a return of £40 per acre. Several varieties of peaches are grown, producing a continuous supply of ripe fruit throughout the season.

In the 7-acre block, there is quite a variety of apricots, peaches, plums, citrus, and vines. These last form the principal crop—some three acres— and are wholly table varieties. The citrus trees are not a success, and are to be taken out and replaced by pear trees. The apricots have not borne well, owing to late frosts, for two years; but in decent seasons yield about 150 hundredweight to the acre, bringing in about £40. From the vines about 120 cases to the acre are obtained, and sold for three shillings a case. The vines are planted in rows 12 feet apart, the distance apart in the row being 9 feet. They are ploughed in autumn, and again in the winter, while during summer some five scarifyings are given.

Manuring is done by peas as already described, by ploughing tares for the vines, but principally by stable manure obtained in Bendigo at sevenpence and upwards per load. Any soil or rubbish obtainable in the neighbourhood is carted in and put to use.

Waterings are given twice a year to the pears, and three times to the vines. In all about one million gallons per annum are used at a cost of a little over £4. As 9 acres are irrigated, the cost comes out well below 10s. per acre. The Solomon's Gully race runs just above the 7-acre block, and a small dam of 60,000 gallons' capacity is connected with it. From the dam a small pipe system affords water to a small plot of pumpkins and other vegetables. Races carry the water to the trees. The whole depth put on appears to be under 6 inches, and, as the water supplied is accurately gauged, it may be accepted as the actual volume required by the trees for healthy growth. At the Flora Hill farm, the water used was equivalent to a depth of 7 inches. Very little of the produce is sent to Melbourne, the local markets absorbing practically the whole.

Not far from here is Mr. Keck's orchard and nursery, covering, in all, some 40 acres. Mr. Keck has been very successful, and his orchard is one of the beauty spots of the locality. He also works his land hard, growing fodder crops, tomatoes, or cabbages between his trees. He gives three to six waterings per annum. After ploughing, a watering means a consumption of about 60,000 gallons per acre; but after scarifying 24,000 gallons only are required. No artificial fertilizers are put in, stable manure, carted from Bendigo at a total cost of 2s. 9d. to 3s. per ton, being used. Mr. Keck is of opinion that a good living can be made off 10 acres of the surrounding country, provided water is available, and that sufficient capital, say, £500, is at the settler's command. This might be much reduced by judicious growth of profitable crops, in the first few years, while waiting for the trees to get into full bearing. It must be borne in mind, however, that the orchardist, to be a success, cannot go in, to any extent, for other pursuits. Trees in their growth require constant personal attention and the continued presence of the grower is a *sine quâ non*.

IN THE MYRTLEFORD DISTRICT.

J. Mathieson, District Inspector of Stock.

The part of the valley of the Ovens River above Myrtleford is usually considered more adapted for mining than for agricultural purposes, and during the last few years some of the best parts of the flats on the frontage have been converted by dredging into immense gravel beds, and rendered absolutely useless for either grazing or cultivation. That some of this land is very valuable may be proved by a visit to the farm now occupied by Messrs. F. Muller and Sons. It is near Ovens Vale, and consists of 270 acres, mostly rich river flats. From what was, a few years ago, practically virgin country, very satisfactory results have been obtained by intense culture, and rotation of crops.

The land under cultivation (not including the garden), comprises 65 acres of oats (cut for hay), 50 acres of potatoes, 20 acres of maize, 8 acres of peas, and about 3 acres of pumpkins. The maize looks very promising, and a good crop is expected. The peas yielded 35 bushels, and 20 acres of potatoes

(early crop), $4\frac{1}{2}$ tons to the acre, while from the late crop of 30 acres, it is expected to bag fully 6 tons per acre. This season some of the early

PUMPKIN FIELD WITH MAIZE PLANTED IN DRILLS FOR SHADE.

potatoes realized £4 per ton, and £7 per ton is now being received. Last season 30 acres yielded 7 tons per acre, and brought £5 per ton. Gross

"CANADIAN WONDER" BEAN PLANTATION.

value, £1,050. The potato seed ("Vermont" and "Up to Date") are sown with a planter, about 3 cwt. of prepared manure being applied at the same time.

Just now the vegetable garden (about 9 acres) is well worth a visit. Here there are $2\frac{1}{2}$ acres of onions, 2 of cabbage, and 1 of tomatoes, besides a great quantity of melons, French beans, carrots, &c., all well grown, and in excellent condition. Consignments are being sent away almost

every day, mostly to towns in the north-east, such as Bright, Wangaratta, Rutherglen, &c.

The estimated yield from $2\frac{1}{2}$ acres of onions is about 19 tons, and from 1 acre tomatoes 20 tons, besides a splendid crop of cabbage, beans, &c. As soon as one crop is used up, it is replaced by another, so that the gross annual income from this valuable piece of land will be very considerable.

The garden is situated in a very pretty bend of the Ovens, that a short time ago was covered with dense scrub, the cost of clearing being about £8 per acre. This, however, is labour well rewarded.

ONION FIELD.

Besides the potato planter and the usual supply of ordinary farm machinery, a four-horse portable engine is used to work a 5-inch centrifugal pump for irrigation purposes. The plant is transferred from place to place as required. The stock on the property includes 10 horses, 6 cows, 40 pigs, and at the present time about 250 sheep. The place is altogether a striking illustration of what may be done on a good farm well worked.

MILK AND DAIRY SUPERVISION ACT 1905.

The following statement with regard to the *Milk and Dairy Supervision Act* is published for general information :—

1. The Act comes into force on 1st July so far as the Metropolitan, Ballarat, Bendigo and Geelong milk areas are concerned. Every farm, wherever situated, which supplies milk for direct human consumption to any part of these areas is included in the corresponding milk area, and comes under the Act.

2. The Act may be extended to any municipal district outside a milk area by the Governor in Council, either at the request of the Municipal Council or without such request. In the former case only the Act is administered by the Council, and several Councils may join together and appoint one supervisor.

3. The Act will be brought into force as early as possible in those municipal districts which have requested to be allowed to administer the Act.

4. In the case of municipalities who do not wish to undertake the administration of the Act themselves, it is the intention of the Department gradually to extend the operation of the Act as fully qualified supervisors are available. In the meantime such municipalities may continue their system of dairy inspection under the provisions of the Health Act. [*In all cases in which it is proposed to extend the operation of the Act to the whole or part of a municipality, three (3) months' notice of such intention will be given to the Municipal Council.*]

5. The annual licence fees to be fixed by regulation of the Governor in Council will be as follow:—

For every dairy farm	6d. per cow.		
For a butter factory	£2	0	0
For each creamery	0	5	0
For a dairy (that is, the premises of a milk vendor where milk is kept for sale)—			
(*a*) Where the milk is sold only over the counter ...	0	5	0
(*b*) Where one to four milk carts are employed	1	0	0
(*c*) Where more than four milk carts are employed ...	2	0	0

(Where a farmer retails the milk direct from his farm no extra fee will be charged beyond that which he pays for his farm. Where a farmer owns also a depôt in the town this will require to be licensed as a separate dairy).

SUPERVISORS.

6. All supervisors, whether appointed by the Department or by a Municipal Council, are required to pass a written and practical examination. Supervisors are appointed for one year only, on the conditions set out below. In case the Department renews the engagement of a supervisor for another year, an increment of £25 will be allowed, conditional on the supervisor having shown *progressive* efficiency during the previous year's work. At least fifteen supervisors will be required to undertake the work of those municipal districts in which the Act comes into operation on the 1st July. Departmental supervisors will be paid an allowance for horse or bicycle, and travelling allowances when engaged in the country.

7. The following section is quoted from the *Milk and Dairy Supervision Act*:—"The supervisors shall not be subject to the Public Service Acts. Each supervisor shall be appointed under a specific contract with him for one year, but shall be eligible for re-appointment from time to time, and he may be at any time removed by the Governor in Council. Shall satisfy the authority that he has had sufficient *bonâ fide* practical experience in dairy farming and its allied branches of agriculture and amongst animals. Shall be selected after a written and practical examination by examiner appointed by the Governor in Council. In such examination special importance shall be attached to the practical part. In lieu of the written part of the examination, the Governor in Council may accept any prescribed public examination. Shall be paid a salary at the rate of not less than £150 per annum, and shall have a district assigned to him annually.

It shall be the duty of each supervisor to become personally acquainted as far as possible with every owner of a dairy farm, dairy, or factory,

and the conditions of every dairy farm, dairy, and factory in his district; to confer with or advise such owner on matters connected with his farm, animals, premises, utensils, milk, and dairy produce when requested to do so, or when instructed to do so by the authority; to inspect and examine all premises, utensils, and appurtenances, and also all animals and their food and water supply, and also all dairy produce at such dairy farm, dairy, or factory, in such manner and by such means as may be prescribed; to make such other inspection, examination, inquiry, or investigation as may from time to time be directed by the authority; and to report to the authority the results of inspections in such form as the authority may require, or as may be prescribed."

EXAMINATION FOR SUPERVISORS.

The examination for dairy supervisors will include written, oral, and practical tests, and will require of candidates a knowledge of—

Dairy Practice, including (*a*) stock management, the breeding, rearing, feeding, and management of dairy cattle; the composition and value of the most important foods or food stuffs; the factors which influence the yield of milk. (*b*) Dairy farm management, including the preparation and cultivation of the land, and the subsequent handling and preservation of the crops, pasture, water supply. (*c*) Milk and dairy produce, their characters, production, examination, preparation, and manufacture, methods of handling and transit; dairy utensils and appliances.

Dairy Sanitation.—(*a*) The arrangement and construction of buildings and yards; (*b*) disposal of drainage and manure; (*c*) methods of cleansing and disinfection.

Stock Ailments.—(*a*) A sound knowledge of the notifiable diseases under the Act including (*a*) symptoms and diagnosis; (*b*) methods of isolation; and (*c*) quarantine and disease prevention.

Candidates with approved veterinary qualifications for appointment as supervisors in milk areas will require to show full and practical knowledge in detail of the anatomy, physiology, and dietetics of farm animals.

Evidence of ability to verbally expound details and facts concerning the above subjects, and to carry on inspectorial duties in a tactful and educational manner, will receive a special recognition in the examination.

The written examination will be held on 4th May, and the practical examination will be held early in the following week. Entrance forms may be obtained on application to the Secretary, Department of Agriculture.

No special text-books are prescribed, but candidates may consult the following with profit:—

Bailey—*Principles of Agriculture.*
Wing—*Milk and its Products.*
Year-Book of Agriculture for 1905.

Seeing that the examination on stock ailments will only cover notifiable diseases, there is no book which deals with these alone in concise form. Standard modern works which may be consulted for these diseases are Law, *Vet. Medicine*, Vol. IV., or Bollar, *Diseases of Cattle.*

The following are set out as model questions and answers in order to give an indication of the style and scope of knowledge required at the examination:—

1. Mention ways in which cowshed, floor, and surrounding ground surface may be kept free from offensive and stagnant animal fluids.

Answer—Assuming that the floor is in good repair, and has an even and watertight surface, a gutter at the rear of the stalls graded with a fall of

1 inch in 10 or 20 feet will serve to carry off the animal fluids. These might be caught in a suitable catch-pit at the end of gutter outside the shed. This receptacle for drainage should be emptied on to the manure heap or on to cultivated ground at a distance every second day, or at all events before it has begun to decompose or give off offensive odours. Another effective plan is to spread a shovelful of dry earth in the gutter at the rear of each cow each time they are milked. The dry earth absorbs the urine, and may be removed along with the dung, so increasing the amount of rich manure compost.

2. On what evidence, both of information and observation, would you suspect the existence of pleuro-pneumonia in a herd?

Answer—Some such contagious disease as pleuro-pneumonia might be suspected in the event of more than one or two cattle having died or suffered severely from an illness of from one to three weeks' duration, especially so if the deaths occurred amongst cattle that had been recently introduced from an unknown source. The suspicion would be strengthened if on inspection and examination of an affected animal it was found to have a combination of some of the following symptoms:—Standing away from the rest of the herd with staring coat, back arched, head extended, and breathing heavily; groaning or subdued grunting at intervals; a cough on being bustled about; rise of temperature to 104 deg. F. or 105 deg. F.; pain exhibited on pressure with the thumb between the ribs.

3. What would you advise a farmer at Preston to do in order to secure a good crop of maize for green fodder next summer (no irrigation being available)?

Answer.—(i.) To secure a good crop of maize it is necessary to provide a good seed bed, and to conserve the soil moisture. Plough the land, and if possible, subsoil it early in the coming winter.

(ii.) Disc harrow it, or use other implement to reduce it to a fine condition whenever it is dry enough to carry the horses.

(iii.) Re-plough about the middle of October.

(iv.) Harrow and plant in drills 3 feet apart, using 1 cwt. of superphosphate to the acre, say about the end of October. If no drill is available, open a shallow furrow, and dribble in the seed and manure by hand. Half a bushel of seed to the acre is enough. Then harrow and roll.

(v.) Harrow again as soon as the plants are well up, or begin to use the cultivator between the rows. Continue to do so as soon as the surface is dry after every shower of rain, or every three weeks if no rain falls. Cultivate about 2 inches deep.

N.B.—The success of the maize crop will largely depend on the amount of farm-yard manure that is available.

4. Give the reasons why you object to little bits of cow-dung falling in the pail while milking.

Answer.—Every kind of dirt of animal origin contains immense numbers of living particles, which are able to live in the milk, and also to multiply very rapidly in it. As they multiply they set up the changes known as fermentation and putrefaction. After a time the milk goes sour and becomes curdled. These changes are objectionable, both in milk intended for direct consumption and in milk which goes through the separator. In the former case its value as an article of food is lessened, and it is very liable to cause digestive trouble, especially in children. In the case of milk used for butter or cheese, the cream will most likely not ripen properly, and the butter or cheese will have a bad flavour, and will not keep well. Moreover, dirty milk or cream quickly destroys the value of clean milk or cream when they are mixed together.

COLAC FLAX-GROWING COMPETITION.

J. Robilliard.

The Agricultural Society, Colac, this season offered three prizes for the best crops of flax grown in the district. There were ten entries, nine of which fulfilled the necessary conditions. The judging was done by points, as follow:—

	Points.
(*a*) Length of staple	30
(*b*) Seed yield	15
(*c*) Evenness of crop	15
(*d*) Preparation of seed bed	20
(*e*) Cleanliness, freedom from foreign matter ...	20
Total	100

The following are the points awarded:—

—	A.	B.	C.	D.	E.	Total.
R. Heppell	21	11	12	15	13	72
J. Inglis	22	10	12	15	11	70
Dr. J. Wynne	18	11	13	13	14	69
W. R. Edgar	19	10	10	13	10	62
— Fish	15	8	11	13	14	61
— Wylie	16	10	9	12	11	58
Jno. Wood	17	9	8	11	12	57
Messrs. Denis and Wettenhall	15	8	10	12	11	56
— Parker	12	6	7	11	11	47

The crops are, on the whole, rather short, owing to having been put in late in the season, but this mistake can be avoided in future Though short, the growth must be considered very satisfactory, when it is remembered the sowing was done between the middle of July and the end of August. The crops, too, generally are of uniform growth, and fairly well headed, though I am afraid the seed will in some instances be rather pinched on account of having been cut a little on the green side. Owing to the want of length, the yield of fibre will not be large, though the results obtained should be sufficiently encouraging to warrant larger areas being put in this coming season.

The Agricultural Department is having a complete set of flax-treating machinery made, with a view to giving demonstrations in flax dressing, and also for assisting growers who may not have a sufficiently large quantity of straw to warrant them in purchasing a plant. I would, therefore, suggest that application be made, in the usual manner, for th use of the thresher, or boll crusher, as the threshing should be done at an early date. It has been suggested that the machine be set in a central position for the purpose of treating the small lots in the neighbourhood.

Each grower would do well to ret the whole of his straw, even though it may be on the short side, as it will give him an insight into the work that will be of value to him should he decide on cultivating flax more extensively next season.

The Agricultural Society is to be commended for the steps taken in endeavouring to introduce flax-growing to the district, for the industry

should prove a very remunerative one. Though the crops recently grown are not all that can be desired, yet the experiment has proved, beyond a doubt, the suitability of the district for the production of flax for both seed and fibre purposes. I am pleased to note that several of the growers intend giving it another trial, and, profiting by past experience, will no doubt be more successful in future. To these and others who may desire to enter into its cultivation, I would like to point out:—

1st. The necessity of thoroughly pulverizing the soil to the full depth of ploughing, and working it up to a very fine tilth, as the crop will well repay a little extra work in this direction.

2nd. The necessity for early sowing. The time will, of course, differ with the various districts and conditions, but May or early June would probably be the most suitable in the Colac district. The object aimed at is to raise a fairly strong well-rooted plant before the cold weather sets in, to enable it to successfully tide over the winter.

3rd. The advantage of having clean ground. All weeds are more or less objectionable, but those such as thistles, wild mustard, dock, &c., are especially so, and if found in the crop, should be removed, for they not only take up ground that should be occupied by flax, but are troublesome in each of the subsequent operations.

4th. Flax should be cut as low as possible, for the fibre commences from just above the surface of the soil, so that each inch of stubble left lessens the yield.

5th It is advisable, when harvesting the crop, to make small sheaves, as they are more quickly and satisfactorily threshed. As this operation is accomplished without cutting the bands, it is somewhat difficult to crush the bolls in the middle of large sheaves.

GARDEN NOTES.

J. Cronin, Inspector Vegetation Diseases Acts.

The Phlox.

Phlox is a genus of hardy herbaceous and perennial species, with the exception of one annual kind (*Phlox Drummondii*). The native habitat of the whole genus is North America. The varieties grown in gardens are mainly herbaceous. They have been produced by cross-fertilizing certain of the species, and are worthy of more general cultivation and attention. They are a class of plants that are ornamental in any garden when well grown, and have been greatly improved during the past few years by culture and selection. The varieties once grown were mostly obtained from *Phlox decussata*, and although beautiful, were limited in range of colour, and rather tall in habit of growth. These varieties and the parent type, were inter-crossed with *Phlox suffruticosa*, from which also garden kinds were raised, the result being the production of a class dwarfish in habit, larger in the individual blooms and trusses, and much more varied in colour. Another advantage is the lengthened period of flowering. Some of the newer varieties bloom much earlier than the older kinds, while others do not flower till later It is possible to have phloxes in flower under favorable conditions for several months. Of the perennial evergreen kinds, few have been cultivated here. They are mostly

dwarf, creeping plants, useful for rockeries, for which use one species—*P. subulata var. Nelsonii*—is grown in the Melbourne Botanic Gardens. The annual species—*Phlox Drummondii*—is a native of Texas, the colour of the original being purple. English and European florists have produced from this annual a great number of varieties or forms. It has become one of the most popular plants grown, owing to its easy culture, hardiness, and range of colour, which embraces almost all shades except blue and bright yellow. One of the best strains is known as grandiflora; others, such as cuspidata (star flowered), and fimbriata (fringed), are pretty.

Phlox Drummondii, grandiflora.

Perennial Phlox "Coquillicot" red, and "Madame Domage," white with pink eye.

Any fair garden soil, deeply worked and moderately manured, will produce good plants that will bloom well. A cool friable loam is best. As the plants flower during the hottest and driest part of the year, a position sheltered from north winds should be chosen in the borders. A fair amount of water is necessary, and the plants will benefit by being mulched early. Most of the later types are from 1½ to 2½ feet in height, a fact which should be remembered when selecting positions for them. The plants should be allowed plenty of room, and not be disturbed for several years, except for propagation purposes. The usual method of increase is by division of the crowns in autumn and spring. Plants may be struck from cuttings of the young growths placed in pots of sandy soil in a cold frame. They may also be propagated from root cuttings. Seeds of the herbaceous kinds should be sown as soon as they are ripe. The plants will not appear until spring under cold treatment, but will flower during their first season. *Phlox Drummondii* is only produced from seeds, which should be sown at various times in spring—the earliest in August, and until the end of October. The seedlings should be transplanted when about 2 inches high. A few of the best herbaceous varieties are:—"Etna," "Coquillicot," and "Flambeau," red "La Neige," "Jeanne D'Arc," and "Mdme. P. Carpentier," white "Madame Domage" (an old variety), "Faust," and "Henri Martin," white, with coloured eye; and "Carillon," "Pluton," "Wm. Ramsey," "Gideon," and "Iris," rose and purple shades.

Flower Garden.

The present is a suitable time for planting hardy evergreen trees and shrubs that have been grown in pots. After rain, and while the ground is warm, the roots become active quickly, and before the soil becomes cold, make fair headway. The advantage gained is that the roots have a deeper and wider hold, and obtain nourishment over a greater area, enabling the plants to start into vigorous growth early in spring. The same advantage is gained by dividing and replanting crowns of herbaceous plants (that flower in spring and summer) at this period. Ornamental grasses should also be divided and planted now. A few clumps are very effective in mixed groups and borders, relieving the heaviness and flatness that is a common characteristic. In large borders pampas grass, bamboos, and eulalias produce the desired effect.

Chrysanthemums grown for large blooms are at their best from mid-April till mid-May. Liquid manure may be applied with advantage until the flowers are half-developed. After that time, no benefit is derived from such applications, but on the contrary, damping of the petals will be induced.

One of the most interesting phases of gardening is the raising of new varieties of flowers from seed. There is very little variation in most annuals, a number of which are species, though seed should be saved, if possible, from any specially good type that may occur; but in what are styled florists' flowers, such as chrysanthemums, dahlias, carnations, roses, &c., that have been largely inter-crossed, any one carefully saving seed from the best varieties may produce something superior to existing kinds. Dahlias from now on will produce flowers of less size and substance, many of which will show the centre, or disc, containing the pistils and stamens. To procure seed likely to produce good varieties, only one class should be allowed to bloom for a time. If the aim is to raise cactus dahlias, all the flowers should be cut that are open or opening. Then allow only those to flower that are of the finest types. It will be advisable to collect pollen during dry warm weather and fertilize the flowers, although dahlias are composites, and difficult to control. Good varieties may be raised from seed saved from flowers without hand fertilization, if good kinds only are blooming in the neighbourhood at the time. After the flowers selected are over, they should be marked, and the whole of the plants may be allowed to bloom as they will. The seed will be ripe in June, and should be cleaned and put away in a cool dry place till spring. Time, and manner of sowing, will be referred to in season.

Kitchen Garden.

Perennial herbs may be increased by dividing the old plants now; herbaceous vegetables, as rhubarb, globe artichokes, &c., require the same method of increase unless raised from seed. Rhubarb thrives best in a rich sandy soil, and existing varieties can only be perpetuated by division. Occasionally good seedlings are noted, but the proportion is small. "Topp's Winter" improved, "Early Albert," and "Myatts' Victoria," are popular varieties of rhubarb. Asparagus growths should be cut to the ground when ripe, and the beds cleaned and top-dressed with short manure.

Celery, cabbage, and cauliflower plants should be set out. Seed of broad beans, and early varieties of peas may be sown. The latter should be trained on a rough, temporary brush trellis. Sowing should be made according to requirements of onion, parsley, cabbage, lettuce, radish, and other seed.

AGRICULTURAL HIGH SCHOOLS.

(REPRINTED FROM THE "YEAR-BOOK OF AGRICULTURE.")

T. Cherry, M.D., M.S.

The response to the offer of the Department to establish Agricultural Classes, the interest which is everywhere being taken in the results of experimental work, and the advance which has taken place in educational methods generally, make it desirable to review the position with regard to the education of the farmer. The introduction of nature study and experimental science into the State schools has laid the foundation, while the establishing of a degree in Agriculture at the University has completed the superstructure. The present seems a fitting opportunity for considering what can be done to bring the advantages of a more thorough training within the reach of every one who obtains his living from the land.

What other Countries are doing.

While the final grades of agricultural education have been long provided for in Europe and America by colleges and chairs at the Universities, it is only of recent years that interest has really been awakened to the requirements of boys and girls after they leave the primary schools. It has been recognised that science lends a helping hand to agriculture through the medium of improved methods, and of recent discoveries, but educationalists have just awakened to the possibility of the great advantage to the majority of the children of farmers if their education can be carried on for one or two years after leaving the primary school. Everywhere there are complaints that population flocks into the city. The question is: Can anything be done to prevent this by moulding the character of the boys and girls so that they become enthusiasts for country life and for country pursuits? Among the earliest attempts to solve this problem are the "Farmers' Schools" of France, established in 1824. Under this system the boys were practically apprenticed to some of the leading farmers in an agricultural district, and learned the practical work of the farm in the same way as they would have done at any other trade. Little attempt was made to further their general education. On the other hand, reading lessons in agriculture were early introduced into the National schools of Ireland. In the case of France we have an example of practice without theory, and in the case of Ireland of theory without practice, and both have failed. Briefly, we may say that in recent years, it is everywhere recognised that theory and practice must go hand in hand—"that in each of the sciences bearing upon agriculture there are a few great principles which may without difficulty be mastered by a boy, and their application to agriculture may at the same time be fairly shown and verified by practical demonstration and by actual experiment. It is absurd to try to make the farmer a chemist, or botanist, or physiologist; but the laws of nature in soil, and plant, and animal are to be his friends or enemies throughout life, and it is essential, if he wishes them to be friends and servants, that he should understand their ways." In Denmark, we find that the practice most generally adopted is for the youths of both sexes, who have completed the primary course, to attend secondary schools for about six months every year. In these, science is taught to all pupils, but it is distinctly subordinate to the literary side of their education. Practice is obtained by working on their fathers' farms or on those of some of the neighbours for the other six months of the year. Indeed, the

sons of well-to-do farmers, who wish to become expert agriculturalists, hire themselves out to the best farmer in the neighbourhood, and do all the work in the same way as an ordinary labourer. Some such combination of practice and theory is thus obtained in most Scandinavian countries. Reliance is placed upon furthering the general education of the farmer by developing what is called a "cultivated common sense." The progress of the northern races depends upon the combination of this side of their character with sound agricultural practice.

With the development of manual training and other practical work in the primary schools of both England and America, the opinion is steadily gaining ground that the true solution of the problem of education for the farmers' sons is to be found in a combination of literary work, scientific study, and practical farming. Under the title of "A Plea for a Great Agricultural School," the following seem to be the conclusions of Mr. James Mortimer, head master of the Grammar School and County School of Agriculture, Ashburton, Devon. (1902):—

> "I should not, however, advocate the above course of study unless it could be combined with actual manual labour. No study of an operation can be of much use, unless one takes part in it oneself. The farmer, whose training we are describing, must be more or less a worker, and his school life ought to afford him opportunities for the training of those muscles and the acquiring of that manual skill which he will have to use afterwards. This manual work should be of a very varied kind. In the carpenter's shop and smith's shop, under careful teachers, he might learn the use of the various tools in wood and iron work, and some knowledge of welding and soldering, which would undoubtedly be of service in his after life. Each boy, according to his age and strength, could have suitable work opportioned him in the byre or the dairy, and in fine weather in the garden or the field. Strong lads of fifteen or sixteen can be taught ploughing and harrowing, hedging and ditching, the management of machinery under supervision, some of the operations of the harvest-field, and many little tasks necessitated by the keeping of stock could be done by boys. In a school with a high tone, the most menial work could be made honorable; and that end could be attained which of all others is at the present time most to be desired for our English youth, the raising of manual labour to its true position as one of the essentially noble forms of human activity." (Page 643.)
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> . . . . .
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> "The main branches of the farmer's education then should be—
>
> 1. Natural science as bearing upon agriculture.
> 2. Mathematics and relations of measurements, and valuations of business methods.
> 3. Manual work such as will enable him to acquire strength and skill in all the operations required on the farm; and
> 4. Elevation of his higher nature, to cultivate in him a taste for what is great and good and beautiful in art, history, and in literature."

Take another example from America. L. D. Harvey, State Superintendent, Wisconsin, writes with regard to agriculture and domestic economy in rural industries, as follows (1900):—

> "A new class of schools needed in rural communities, to be known as county schools for instruction in agriculture and domestic economy. . . . .

"Extend the idea upon which the county training schools for teachers were organized so as to provide for the establishment of county schools for instruction in agriculture and domestic science. Give to any county establishing such a school State-aid to the amount of at least one-half the sum actually expended for purposes of instruction in such school. Admit to these schools boys and girls who have at least completed the course of instruction in the elementary schools, and who have reached the age of sixteen. Provide for courses such as I have already considered in discussing the body of knowledge which should be taught, including manual training, and make the course two years in length. Add to the courses already indicated such instruction in language, literature, history, and mathematics as may be carried on in connexion with the other work. Such a school should have in connexion with it a small tract of land to be used for illustrative and experimental purposes; not the line of experiments which the agricultural experiment station undertakes, but a more simple line which could be carried on under the direction of the teachers, and which would be of value for observation and training purposes. Such a school could give, in addition to the other work, a great body of the work now given in the short courses in agriculture offered in our agricultural colleges, and it could carry on work in some lines considerably in advance of what is now undertaken in those short courses."

Can any Knowledge of Agriculture and Kindred Subjects be properly taught to Children of from fourteen to seventeen years of age?

As has already been indicated, this question is almost universally answered, in other countries, in the affirmative, but two methods, sharply distinguished from each other, are used to attain the object in view. We have the first method recently adopted in Canada and long in vogue in the National schools of Ireland, in which a text-book on agriculture is placed in the hands of school children, and the lessons committed to memory, with illustrations drawn in some cases from the school garden, to lend a practical interest to these studies. At the other extreme, we have the farm schools of France run upon purely "practical" lines. Here the children were placed in charge of some of the largest and best farmers in the district, the chief attention being devoted to the pupils becoming acquainted with all the practical details of the different operations of agriculture, while the corresponding book work was comparatively neglected. The fact that these schools have, within the last ten years, been completely abandoned in France indicates that, at all events, they do not fulfil the objects for which they were established. Between these two extremes, we find every variety of expedient. In all cases it must be admitted that there is a great deal which children should be taught after they have left the primary schools which ought to fit them for more completely fulfilling the duties of their future sphere of life. The most reasonable position to take, in our opinion, is the stand-point adopted in Denmark, Belgium, Hungary, and some of the leading agricultural States in America adapting their system to the special circumstances of rural life in Victoria. It must be remembered that Victoria differs from almost all other countries in the fact that there are no class distinctions, the vast majority of the farmers are fairly prosperous and hold large areas of land, nearly all avail themselves of our far-reaching system of State

education, and the conditions of labour are such that each farmer has, to a very large extent, to trust to his own exertions. The system, therefore, which answers admirably among the peasant proprietors of Denmark or France cannot be transplanted without alteration to our State. If Denmark and France depend upon their educational systems to keep them in the van of agricultural progress, it needs scarcely to be argued that our farmer requires to be more highly educated still. To compete with foreign countries we require to be able to make full use of all the powers of nature, to utilize our live stock to the best advantage, and make machinery do as much as possible. In other words, we require to be prepared and equipped to take full advantage of every advance which has been made in the theory and practice of agriculture and to adapt our methods promptly to the ever-varying circumstances which competition is bringing about. As an example may be noted the changed outlook with regard to the cultivation of wheat in all parts of Victoria—the old single-furrow plough has been replaced by implements requiring six or eight horses to draw them; 3s. worth of manure to the acre has restored the fertility of the worn-out lands; the well-worked fallow has rendered available much of the locked up fertility of the soil; and all the operations of cultivation and harvesting are carried on by expensive and complicated machines. Scientific methods of storing the grain during last harvest would, in many cases, have been equivalent to an additional 3d. per bushel for the crop. Knowledge, resourcefulness, and business capacity are manifestly of value in every stage of the wheat industry. Precisely similar facts might be quoted to illustrate the importance of knowledge in connexion with all our staple products. Where the activity of the farmer is centred round the animal rather than round the plant, knowledge and resourcefulness become more important still. We take it as beyond question that a farmer's mind requires to be educated in the widest sense of the word, as well as stored with the bare facts of agricultural practice gained from experience alone. To apply his knowledge and experience he requires not only to know what to do, but also to know why he does it. Circumstances and conditions vary so much from year to year that rule-of-thumb methods very soon become obsolete. Therefore, in order to make a success of farming at the present day, it is advisable that the laws of nature as they are found in connexion with the soil, the plant, and the animal, should form subjects of study. A farmer should grow up familiar with the great practical principles which result from an understanding of these laws. Minute details may be left to the higher colleges and university education, but the chief facts should form part of the stock in trade of every one engaged in agriculture. In such subjects as the soil, rainfall and water supply, cultivated plants, animal life, the economics of agriculture, manual training, domestic economy and hygiene, there is a wide range of study bearing directly upon the success of the student in after-life; each and all of them come up before the farmer in his every-day duties; they are the things which he reads about in the newspapers and journals, which take him to the markets and shows, which bring him to town on business, and which, unconsciously perhaps, absorb practically the whole of his mental energy. There is no question at all of their scope and importance. In comparison with them, the amount of knowledge required by the artisan, the manufacturer, or the man of business seems comparatively insignificant. Each of these subjects comprises a wide range of details; and to attain a high standard of excellence in any of them requires

specialization. We seldom find a first-class dairyman who professes to know much about sheep, and *vice versâ*. If a man is to acquire a sound knowledge of the rudiments of them all, it is certain that his education must be carried on systematically and practically. To leave him at the stage where he is left by the present State school syllabus is emphatically not sufficient. His needs should be provided for by a system of continuation schools, in which his studies are kept to those subjects bearing directly upon his life work. The attempt to secure the young farmer after he has left the State school for a number of years, and bring him back to educational work, either at the short courses of study on agricultural subjects or at an agricultural college, does not give satisfactory results. In the meantime, other claims and duties have occupied his time. From the age of fifteen to twenty he has practically fallen out of the habit of serious study. As a general rule, he is not so well up in the ordinary State school curriculum as he was at the time of leaving; and the attempt to resume the habits of study is difficult enough, even were the subjects the same as those he had been formerly accustomed to; and when entirely new subjects are attempted, when, so to speak, he has to learn the language of science from the beginning, failure is almost certain to result. It is attempting to climb up an educational precipice instead of ascending by an inclined plane.

A striking instance of the benefit of using the discipline of education to improve the industrial conditions of society in the country is seen in the case of Denmark. The Danes rely almost entirely on what they call the highly-developed common sense of the farmers. They claim that this is chiefly due to their system of rural high schools; and it is noteworthy that in these high schools there is less attempted on purely practical lines than in any other system of agricultural education of the same grade. It is this system of education which has raised the Danish peasant from being amongst the poorest in Europe to his present position at the top of the tree. It is noteworthy to observe what crises in the history of Danish agriculture have been successfully overcome simply by the intelligence of the farmers. Twenty-five years ago it was found that raising grain for export ceased to be profitable. They immediately changed their system of farming, established their present system of dairying, and bought cheap grain from foreign countries to supply food both for themselves and for their live stock. Hardly had the dairying become fully established when swine fever broke out in a most virulent form. The export of live swine fell from 300,000 in 1886 to 16,000 in 1888, yet they successfully controlled the disease and built up their present ham and bacon industry, which now ranks second in importance to the export of butter. Again, in 1897, it was discovered that nearly half of the dairy cattle in many districts in Denmark were affected with tuberculosis. The farmers set to work at once intelligently to apply the regulations of the Danish Minister of Agriculture, with the result that at the present time the disease has been almost completely eradicated. There is probably no State in the world where the successful carrying out of all details connected with farming interests is left so much to the educated "common sense" of the farmer.

That a judicious combination of science teaching and literary work forms the ideal system for educating the future farmer, in the wider sense of the word, is a proposition that is not likely to be disputed. We have indicated already some of the ways in which this education may be made to equip him specially for the work of the farm. Assuming that the

foundation has been laid in nature-study and in elementary science at the State school, the science of the first year at an agricultural high school might comprise physics, chemistry, mathematics, English, the outlines of physiology and geology, drawing, and bookkeeping (domestic economy and domestic hygiene, if girls are included in the scheme).

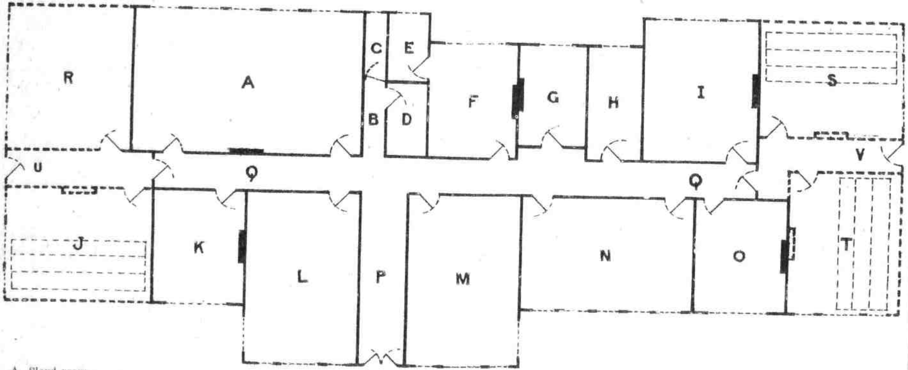
The second-year work, while continuing the English studies, might comprise botany, zoology, meteorology, and agriculture. Under the latter would be included the soil, farm operations, fertilizers, plant production, and the live stock of the farm.

Starting in this way from the great principles which underlie all natural science, and working up gradually to their special application to agriculture, verifying and illustrating each step by the work which the pupil himself does in the practical courses (which would form at least one-third of the total work of the course), we think that agricultural knowledge treated in this way may be made the basis for a fuller and more thorough equipment for the future work of the farmer.

ORGANIZATION OF AN AGRICULTURAL HIGH SCHOOL.

In a country centre where an attendance of 50 to 100 pupils could be guaranteed, the Agricultural High School should be worked in connexion with the local State school, controlled by the Education Department, but managed with the advice and co-operation of the Department of Agriculture and a local committee. The staff would consist of teachers specially selected by the Education Department on account of their fitness for work of this kind. The ordinary hours of attendance would be enforced, and the school, generally, conducted on the same lines as the Continuation School in Melbourne, but with all the subjects tending in the direction of agriculture. As already indicated, these subjects would be almost exclusively scientific; and the education would be largely a training of the hand and eye and powers of observation through the medium of practical work. Laboratories, workshops, and an area of land for experimental work would, therefore, be necessary. Its aim would be to impart a sound knowledge of the fundamental principles of the sciences which underlie agriculture, together with a knowledge of the methods by means of which these principles are carried into practical effect.

In a school of this type the aim should be to continue the education of the boys and girls in subjects of direct advantage to them in future life. A small farm should be attached to each of the schools, and in this farm all the ordinary and special operations should be carried out by the students themselves. A sound training in farm methods may be given on a small area of land without difficulty. About two-thirds of the time should be devoted to school and laboratory work, and one-third of the time to practical work on the farm. The heaviest part of the cultivation could be carried out each year with a horse and plough, but after the rough work was thus done, the experimental and demonstration work in connexion with cultivation, drainage, manuring, conservation of moisture, &c., could be carried out on a series of small plots by a few of the students working together. Ample material for the practical work for the advanced classes could be found in special problems, such as selection of seeds, introduction of new varieties, the improving of existing varieties and many other points which involve close observation, extended over a large number of individual specimens of plants.



A	Sloyd room	..	40′ x 25′
B	Corridor, leading to C and D	..	13′ x 3′ 6″
C	Teachers' lavatory, for washing only	..	12′ x 3′ 6″
D	Boys' lavatory	..	13′ x 7′ 6″
E	Girls' lavatory	..	12′ x 7′ 6″
F	Girls' common room—lockers, hats, &c.	..	20′ x 16′
G	Teachers' office and sitting-room	..	18′ x 12′
H	Store-room	..	20′ x 10′
I	Class-room	..	25′ x 20′
K	Boys' common room 'ockers, hats, &c.	..	20′ x 16′
L	Chemistry laboratory	..	30′ x 20′
M	Physics and nature study laboratory	..	30′ x 20′
N	Cookery room	..	30′ x 20′

O	Dining-room	..	20′ x 16′
P	Entrance hall	..	30′ x 8′
Q	Main corridor	..	118′ x 6′
U	Exit to boys' offices		
V	Exit to girls' offices		

FUTURE EXTENSION—

J	Class-room	..	25′ x 20′
R	Metal work-room	..	25′ x 21′
S	Class-room	..	25′ x 20′
T	Class-room	..	25′ x 20′
	Additional corridor	..	38′ x 6′

SKETCH PLAN OF AN AGRICULTURAL HIGH SCHOOL TO ACCOMMODATE 100 PUPILS.

(Designed by Mr. John Byatt, Inspector of Manual Training, Education Department.)

Such work would develop the faculties, quicken the power of observation, and engage the interests of all the students; while in a few years' time 10 acres of land worked on this principle would constitute a most valuable experimental plot for the purposes of the Agricultural Department. At the present time, upwards of £3,000 a year is spent in experimental work on about 70 plots scattered throughout the whole of Victoria. The weak point of the present system is due to the fact that it is impossible to supervise each plot so as to keep continuous accurate observations going on, and so as to carry out each operation precisely at the right moment. A dozen school farms would, we think, be much more satisfactory from both of these points of view, and furnish results of much greater value than our present experimental plots. Arrangements might be made with the local Agricultural Societies, through representatives on the local committee, to do the ploughing and harrowing when required, and to advise the Director of Agriculture generally with regard to the special management of these plots. The interest of the whole of the surrounding agricultural community would thus be centred in the school. The interest which the children would have in the plots would keep the work under the notice of their parents, and we have no doubt that the influence of the experimental work of the Department of Agriculture would become more far-reaching by this means than by any other method.

The equipment, therefore, for an Agricultural High School would consist of two class-rooms, two or three work-rooms and a school farm of at least 20 acres. The buildings should, if possible, be erected in the same enclosure as the State school, or at all events close at hand; so that the two schools may be under the one head-master, and the staff of the one school be available for special work at the other. The farm should be within reasonable distance—say, not more than 2 miles away—while it would be an advantage to have the farm immediately adjoining the school buildings. We estimate the average cost of the buildings and equipment at £1,500. The land for the farm, for the most part, could be secured from neighbouring public reserves, but an additional £500 would be required for getting the farm in order and equipping it with the necessary tools and appliances for the students. The fees collected from pupils will pay about two-thirds of the cost of tuition in the case of 50 students. In the case of 100 students, the fees will pay nearly the whole cost of tuition.

In districts where Schools of Mines or Technical Colleges are already in existence, it is possible that some arrangement could be made whereby the work of such a college could be amalgamated with the work of the High School. This would necessitate the Department of Education practically taking over the whole control of the college; but as the special circumstances of the School of Mines, &c., vary in each centre, we would suggest that no general scheme be formulated for dealing with them, but that each be treated separately when occasion arises. In any case, only the small Technical Schools would be considered in this connexion.

In order to secure the interest of the farmers in the neighbourhood, a local committee should be formed to assist with its advice in the general curriculum of the school, and to take a specially active part in the work of the school farm and the experimental plots connected therewith. In many cases such a committee could be elected by municipal councils, agricultural societies, and private subscribers to the funds of the High School. They would not have power to appoint or dismiss teachers directly;

but by giving them an active part in selecting the teachers from a list supplied by the Department, and in co-operating with the Department of Agriculture in the cultivation and general management of the plots, there is little doubt that sufficient local interest would be maintained to secure the co-operation of an active committee.

Regulations.

1. The Minister of Public Instruction may establish Continuation Schools, to be called Agricultural High Schools, under the following conditions:—

(*a*) At least one-half of the cost of the necessary buildings and equipment shall be contributed by local subscription.

(*b*) An area of ground of not less than 20 acres, situated in a position convenient to the High School, shall be provided, and vested in the Minister.

(*c*) At least 50 students paying prescribed fees shall be guaranteed before a proposal to establish a High School is entertained.

2. (*a*) Agricultural High Schools shall be under the control of the Minister, who will be assisted in the questions affecting course of study and general policy by a committee, consisting of the Minister of Agriculture, the Director of Education, and the Director of Agriculture.

(*b*) A local council, consisting of five members, to be appointed by the Governor in Council, shall be established for each district High School. Their duties will be to exercise a general oversight in matters affecting their school, to expend the maintenance allowance allotted to each school, to exercise such supervision as the Minister may authorize over the farm operations, and to advise the Minister in all matters specially pertaining to the school.

3. The qualifications for enrolment of students shall be as follow:—

(*a*) Pupils must have obtained the Certificate of Merit, or must have passed the primary or some higher examination of the Melbourne University; or must have satisfied an inspector of schools that they are qualified to profit by the course of study in such school.

(*b*) They must furnish satisfactory evidence that they are of good moral character, and of good general health.

(*c*) They must be at least fourteen years of age at the date of enrolment.

4. The Minister may grant in each year scholarships entitling holders thereof to free tuition for two or more years in any approved courses of study prescribed in Agricultural High Schools.

5. The Council of any Agricultural High School may nominate for free instruction in any prescribed courses of study in that school students who possess the qualifications stated in section 3, provided that the number of students so nominated shall not in any year exceed 10 per cent. of the total number of students paying full fees enrolled in that school.

6. The course of study shall include such subjects as may be determined upon by the Minister, with the advice of the committee named in section 2*a*.

7. At least one-third of the time devoted to instruction shall be spent in the study (both practical and theoretical) of the sciences bearing upon agriculture, and one-third of the time shall be devoted to manual and practical work on the school farm or in the school workshop.

8. During their course in an Agricultural High School, students will be required to attend lessons regularly and punctually in the subjects prescribed for their course, and may further be required to devote such time to practical outdoor work as the Principal may direct.

9. The fees to be paid by pupils shall be £8 8s. per annum, payable quarterly in advance.

10. No pupil shall be enrolled after the expiration of the first quarter unless with the special sanction of the Director of Education.

11. Any students may be excluded from attendance at the school on the ground of idleness or misconduct.

12. Holders of scholarships under Regulation XXI. 1(*b*) may be admitted as students at any Agricultural High School, and attendance at such school shall be held to comply with the conditions laid down in such Regulation for attendance at a Continuation School or Secondary School.

13. Candidates for admission to the teaching service of the Education Department may be admitted to an Agricultural High School under the conditions of Regulation X. for admission to a Continuation School, and all the provisions of such Regulation so far as they may be applicable shall be held to apply to Agricultural High Schools as regards such students.

DUCKS FOR EXPORT.

A. Hart, Poultry Expert.

The excellent results which have been obtained with the trial shipments of ducklings sent to Great Britain from Victoria must prove satisfactory to all parties interested in the export trade. It is certainly very encouraging to breeders, and there appears every indication of a very valuable and extensive business being established in the export of ducklings and poultry to the London market, *provided that the birds sent are suitable to the requirements of the trade.* The price realized for one shipment was 6s. 10d. per pair, and in a rather unfavorable market. This point, coupled with the fact that trial shipments are looked upon by the London dealers with a certain amount of suspicion, goes to prove that it is certain that higher prices will be obtained when a suitable market is experienced, and the shipments of ducklings become an established and regular supply on the London markets. There is an almost unlimited demand for both ducklings and chickens in Great Britain, and the enormous quantity of poultry consumed there every year should certainly be, to a certain extent, supplied by this and our neighbouring States.

The main requisites towards a successful export trade from Victoria to Great Britain are as follow:—

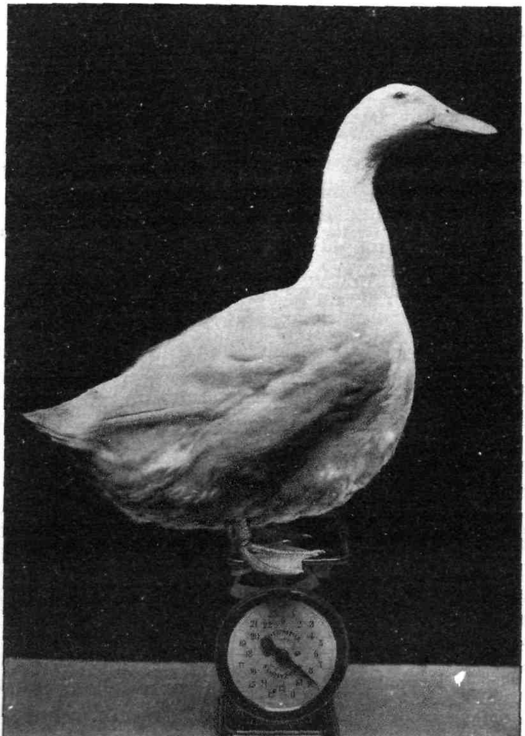
1. The breeding of birds which will command the highest value in the London market.

2. The rearing and fattening of the birds at as early an age as possible.

3. The killing, grading, and packing to be performed with great care, so as to insure the poultry being landed in good condition, and presenting a good appearance, and therefore likely to prove satisfactory to the consumer.

4. Selecting the proper seasons for shipment of both ducklings and chickens.

5. A proper supervision at the receiving depôt, and the appointment of direct agents, who will give the industry their undivided attention, and thereby minimize the cost of handling and placing on the market.



YOUNG AYLESBURY DUCK, WEIGHT 9 LBS.

The duck-breeding industry has attained enormous proportions in America, and many breeders are making the business a very profitable undertaking on a large scale. Mr. J. Rankin breeds 10,000 young ducks

yearly, and makes them pay handsomely. At the village of Eastport, Massachussets, it is estimated that not less than 500,000 spring ducklings are reared every year within a radius of 8 miles. Another very extensive duck farm is run by Mr. B. F. Bremdred, Crystal Springs, Pennsylvania. The annual output of this farm is from 35,000 to 40,000 spring ducklings and 5,000 chickens every year. These figures are only a sample of many which might be quoted, and go to prove as to how large an extent the duck-breeding industry can be made, and with payable results. If these results can be obtained in America, there is not the slightest reason why they should not be produced in our State, where the general conditions attending duck-rearing, feeding, &c., are quite equal to those of America, and in some cases even better. We cannot of course expect to equal the above figures for some time to come. An industry of this kind has to be established on a sound basis, and grow and develop with time and experience. There are, however, very encouraging prospects offered in the export trade of ducklings, and breeders have the final result practically in their own hands. If they begin on correct lines and produce birds which are of the requisite quality and condition, it is quite probable that this industry may assume very large proportions in the near future.

The following extract from *The Age* of 16th June gives the views of a Smithfield (England) dealer on Australasian poultry in the British markets. He says:—"From the criticisms passed by leading dealers on the consignments of ducklings, turkeys, and chickens which have been received within the last few weeks at Smithfield from Victoria and Queensland, it appears that there can no longer be any doubt as to the ability of Australia."

HINTS TO BEGINNERS.

To obtain the best results in breeding for market, you must start with pure-bred stock, and set the eggs from your own birds.

Aylesbury drake with Pekin ducks makes a suitable cross for export. Allow three or four ducks to each drake. This cross matures quickly, and grows to a large size, with flesh of good flavour, colour, and texture.

Use first season drakes with second season ducks, or *vice versâ*.

See that your breeding ducks are comfortably housed in cold weather, so as to keep up the egg supply. A ground floor is the best for ducks. It should be of clay, well rammed down, and raised a few inches above the level of the ground.

All ducks should be bedded down with straw, pine needles, shavings, &c., in the laying season, so as to keep the eggs clean.

A variety of food should be given to the drakes during the breeding season, as a vigorous condition is necessary to fertilize the eggs.

Breeding pens of ducks should be kept strictly to themselves.

Access to water should be allowed occasionally to breeding ducks to obtain best fertilizing results.

Ducks should not be allowed in the water when the weather is very cold or frosty.

Use hen turkeys for incubation. Give them a teaspoonful of port wine, and they can be made to set at any time. Place the turkey on some china eggs at first in a dark box where she cannot stand up properly, and as soon as she takes to the nest, put the duck eggs under her. They may be set twice without injury if fed and watered regularly every day.

All duck eggs should be tested on the seventh day, and the infertile eggs removed. Night is the best time for the examination.

YOUNG PEKIN DUCK, WEIGHT 8 LBS.

A cheap foster-mother for young ducks can be made out of a kerosene case placed on its flat. Put a quart flat bottle filled with hot water in the centre of the box. Cover it with brown paper, and then put sawdust, chaff, or straw over it. This will provide warmth for the ducklings, but

is only to be used when small numbers are reared or in cases where proper brooders cannot be procured.

Incubators that allow of plenty of moisture to the eggs are the most suitable machines for hatching duck eggs.

The best green stuff to grow for ducks is maize, which should be cut young. Thousand-headed kale, lucerne, rape, and all other green food should all be chaffed and mixed with the soft food.

Store your grain and meal in the months of January and February, when it is cheap. Old piano cases, tin lined, are very suitable bins.

To start young ducks, and also young ones after moulting, to lay, use maize meal with a little green cut bone for the winter months in their morning meal.

The best food for old ducks is two parts pollard, one bran, one lucerne and chaff, adding a little salt. The chaff should be scalded and steamed in a covered vessel. All food should be given fairly soft, and fed in "V"-shaped troughs. They can be made with two 6-inch flooring boards nailed together, and cross pieces at the ends to keep them steady. A trough 8 feet long will do for eighteen or twenty ducks.

All grit should be given to ducks in water, using a shallow dish so that they cannot get their eyes under the water. Grit masticates the food, and increases condition and also egg supply.

Animal food should be given two or three times a week.

Always buy the best quality of grain or other food. It is the cheapest in the end.

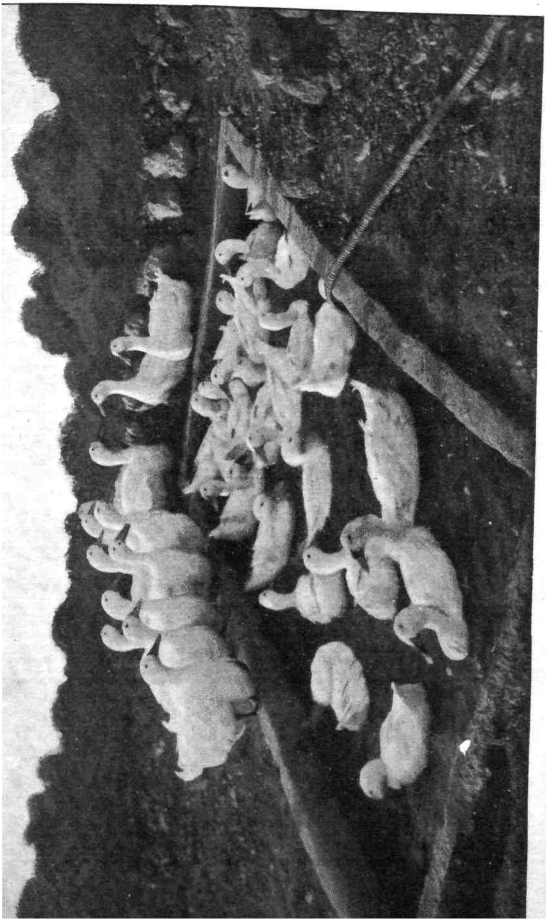
Cottage holders should make the nests on the ground when using hens to incubate duck eggs.

Have your thermometers tested every season, as they are very liable to get out of order.

THERE IS MONEY IN DUCKLINGS.

Ducklings are more profitable to cottage holders than chickens, as they are hardier, mature more quickly, and can be marketed at little more than half the age. There is always a sale for export poultry of excellent quality delivered on the London market in satisfactory condition. Most of the white Aylesbury and Pekin ducklings sent there from Melbourne are described as particularly fine birds, and suited to the requirements of the best West End trade. They realized 6s. 10d. per pair, though it happened that the state of the market was rather unfavorable. Had the general demand been better they would have brought from 8s. to 8s. 6d. per pair, according to the wholesale dealer who sold them. Queensland chickens, which had been killed two months, were sold at 3s. 3d. each, and hen turkeys from the same State realized 9d. per lb.

During the twelve months ending 30th June, 1905, Victoria exported 46,708 head of frozen poultry. This number could have been increased tenfold if the quality of the birds sent in to market had been of the desired quality and condition. One point which should be of much value to the producer of ducklings and chickens is that all poultry for export is purchased by weight. The price paid last season was 6d. per lb. live weight. This should certainly induce poultry breeders to feed their birds liberally, and produce weight in them, as it is known with a degree of certainty that they are likely to realize payable prices, both locally and for export, practically all the year round. These prices are not influenced in any way by a rising or falling market for well-fattened ducklings.



AN IDEAL DUCK POND, WITH SHELTER, WHICH IS A NECESSITY FOR SUCCESSFUL DUCK-BREEDING.

The best food for young ducks for quick maturing is pollard, barley meal, bran, rendered fat, and skim milk. Nothing will mature them quicker than milk. All meal should be scalded, and drinking water given occasionally.

All eggs found infertile when testing may be sold or given to the young ducks.

The best age to market ducklings is from nine to eleven weeks old, when they are in their first feather.

Farmers, in sending birds to market, should grade them as near to age, weight, and condition as possible. Condition and uniformity in size will always top the market, either in London or locally.

Ducklings for market should not be allowed in water. They should be kept in pens of moderate size, which should be warm, high and dry. Keep them in lots of 25 or less, and feed four times a day from the time they leave the shell.

Give ducklings a little bone meal twice a week in their morning food. It will increase the size and prevent leg weakness.

The best months for matured ducks in our local markets are June, July, and August.

The best months for export ducklings to ship from here to the London market are November, December, and January.

All young ducklings, when being fattened for market, should be penned as even in size as possible. The smaller ones will not get as much food as the larger, and their size and growth will be retarded.

All ducklings exported from Victoria were passed by the Government expert, and after leaving his hands they were weighed, and the vendors paid for them in cash on the same day.

The charges made by the Department to the shipper, which cover grading, plucking, packing (including case), and freezing, amount to 7d. per pair for ducklings and chickens, and 1s. per pair for turkeys and geese. No charges are set down to the vendor.

The Department of Agriculture does not buy poultry, but receives same alive if suitable for export, kills, plucks, dresses, provides packages, packs, freezes, and ships on account of consignors at the rates above mentioned.

The following are the names and addresses of poultry exporters who are prepared to purchase outright for export, or ship for producers on consignment. Poultry growers should write to any one of these firms beforehand, and get particulars of prices and conditions. If satisfactory arrangements can be made, a letter asking for railway poultry crates for the number and class of birds should follow :—

POULTRY EXPORTERS.

Angliss and Company ...	44 Bourke-street, Melbourne.
Borrett, J. R. ...	6 Fish Market, Spencer-street, Melbourne.
Bradbury, J. W. H. ...	City Markets,, Flinders-street, Melbourne.
Cooke, John ...	Corner Collins and King streets, Melbourne.
Joubert and Joubert ...	552 Flinders-street Melbourne.
MacMeikan, N. H. ...	495 Collins-street, Melbourne.
Meadows, N. E. ...	Flinders-street, Melbourne.
McMeekin Brothers ...	547 Flinders-street, Melbourne.
Watson and Company ...	Spencer-street, Melbourne.

Should growers be unable to make unsatisfactory sales locally, and desire to export on their own account, or through an agent, they are recommended to consign to any of the following firms:—

LONDON POULTRY SALESMEN.

Broome, F.	263, 264, 266 Central Markets, Smithfield, London, E.C.
Brooke Brothers ...	206, 207, 307, 308 Central Markets, Smithfield, London, E.C.
Freeman, J. J., & Company	208 and 209 Central Markets, Smithfield, London, E.C.
Keevil and Weston ...	228, 231 Central Markets, Smithfield, London, E.C.
Kerry, Hull, and Juniper	369 Central Markets, Smithfield, London, E.C.
Walkden and Company ...	275 Central Markets, Smithfield, London, E.C.
Weatherly, E.	246, 248 Central Markets, Smithfield, London, E.C.
Webb, Henry John ...	377, 376, and 329 Central Markets, Smithfield, London, E.C.

Poultry for export should be legibly addressed and consigned to "The Superintendent of Exports, Government Cool Stores, City Markets, Flinders-street, Melbourne." Railway carriage right through must be prepaid. *At the time of despatch,* a letter giving full particulars of the number and class of birds, the name of the agent (if to be shipped through one), and the name of the Melbourne agent to whom rejects (if any) are to be delivered to should also be sent to the Superintendent of Exports. In the event of no agent being employed, instructions should be given as to payment of charges and ocean freight, &c., and disposal of bills of lading, together with name of steamer and consignee.

WHEAT EXPERIMENTS.

ABRIDGED FROM THE REPORT ON THE EXPERIMENTAL WHEAT CROPS GROWN DURING THE SEASON 1905.

F. E. Lee, Agricultural Superintendent.

It is now some few years since any comprehensive experimental work has been conducted by the Agricultural Department in the northern wheat areas. The attention of those interested will again be aroused by the harvest returns of a number of large experimental areas, established with the purpose of studying farming problems in the north, over a continuous term of seven years. The late Chemist for Agriculture, Dr. Howell, obtained authority to establish these semi-permanent areas, the owners of the land undertaking, under a signed agreement, to carry out the Department's wishes over a period of years.

OBJECTS OF THE EXPERIMENT.

In any experiment conducted on a large scale, and over an extended period, there naturally arise a number of matters requiring systematic investigation. One of the most prominent features in connexion with

wheat farming to-day is whether the present requirements of the Mallee, Wimmera, and Goulburn Valley soils will continue to be adequately filled by the use of phosphatic manures alone for an indefinite period. Farmers are also commencing to inquire what will be the effect of the continuous use of one class of manure only, and whether the present cheap and effective means of meeting soil deficiencies may not conceal some obscure penalty, the consequences of which may imperil the great grain industry. The expansion of the trade in fat lambs has awakened the northern farmer to the consciousness that his operations must be arranged so as to permit of the regular feeding of his stock, if the best results are to be looked for. This means fodder crops, and at the same time calls for knowledge as to which are the crops that can be most advantageously rotated with cereals.

Improvements in the methods of cultivation, often the result of accident, have shown the enormous capabilities of development in this direction. While radical changes are not contemplated, there are abundant grounds for the belief that improved cultural operations will play a more prominent part in crop production than has been the case since the use of artificial manures became general. There are few, I believe, who will dispute the statement that the manure is too often called upon to grow the crop, and the most perfunctory assistance is rendered by the cultural operations.

Broadly speaking, the experimental fields comprise:—

(1) Manurial tests.
(2) Cultivation trials.
(3) The introduction of new wheat and oat varieties.
(4) Green manuring.
(5) Fodder crops for ensilage and green feed purposes.

CONSTITUTION OF THE FIELDS.

Each field is approximately 11 acres in extent, and is divided into four distinct sections, lettered A, B, C, and D. Section A is 1¾ acres, and has been dressed with different forms and amounts of phosphatic manures, both singly and combined with nitrogenous forms. Potassic manures also find a place in the complete dressings given in some plots.

Section B, representing 1¼ acres, has, in addition to receiving exactly similar dressings of manures as in A, been subsoiled.

Highly interesting comparisons of the effects of manures may thus be drawn between non-subsoiled and subsoiled land.

Section C, in area about 2½ acres, was devoted to the trial of new and improved varieties of wheat and oats, a report of which has already appeared in the March number of the *Journal.*

Section D, comprising about 4½ acres, was set apart for the growth of crops suitable for ensilage and green feed purposes, a detailed report of which will appear later.

SUBSOILING.

Before entering into a criticism of the harvest results of the various sections, it may not be out of place to explain that the subsoiling of the fields was, in the great majority of cases, done at such a late period that the first year's results should only be accepted with caution.

The subsoiling was done by means of two single-furrow ploughs, one minus the mould board, following the other in the same furrow, and stirring the subsoil to an average depth of 9 or 10 inches. To be thoroughly effective, subsoiling should be done at the time of fallowing, whereas most of the fields were not completed till the months of November and December, and some not till January and February, just prior to sowing in April. When it is remembered that one of the principal reasons for subsoiling is to conserve rainfall, it is not difficult to understand that this trial has not yet had an opportunity of showing what it is capable of doing in the drier portions of the State. I have ascertained, by wide inquiry from farmers, that at least an extra bag of wheat per acre will require to be produced before subsoiling can be said to pay. This statement may yet have to be modified, and with the introduction of a suitable implement, there is little doubt that the cost can be reduced.

MANURE DRESSINGS.

The manurial dressings of Sections A and B were applied at the following rates per acre:—

Section A	Section B.	
Plot 1	33	40 lbs. ordinary superphosphate.
,, 2	34	No manure.
,, 3	35	56 lbs. ordinary superphosphate.
,, 4	36	75 lbs. ordinary superphosphate.
,, 5	37	No manure.
,, 6	38	16 lbs. concentrated superphosphate.
,, 7	39	22 lbs. concentrated superphosphate.
,, 8	40	No manure.
,, 9	41	30 lbs. concentrated superphosphate.
,, 10	42	58 lbs. Thomas' phosphate.
,, 11	43	No manure.
,, 12	47	56 lbs. superphosphate, and 28 lbs. sulphate of ammonia.
,, 13	48	56 lbs. superphosphate, and 30 lbs. nitrate of soda.
,, 14	49	No. manure.
,, 17	46	No manure.
,, 18	50	56 lbs. superphosphate, and 56 lbs. sulphate of ammonia.
,, 19	51	56 lbs. superphosphate, and 60 lbs. nitrate of soda.
,, 20	52	No manure.
,, 21	53	56 lbs. superphosphate, 28 lbs. sulphate of ammonia, and 28 lbs. potash chloride.
,, 22	54	56 lbs. superphosphate, 30 lbs. nitrate of soda, and 28 lbs. potash sulphate.
,, 23	55	No manure.

Plots 15 and 16 in Section A, and 44 and 45 in Section B, were manured with 56 lbs. superphosphate per acre, but were used as path plots.

Section C received a uniform dressing of ordinary superphosphate at the rate of 56 lbs. per acre.

OTHER MANURIAL DRESSINGS.

In sections A and B, plots of rape, peas, and clover, dressed with superphosphate and Thomas' superphosphate, were ploughed down for green manure when in full bloom. When these sections are cropped again, especial notice will be taken of their effect on the yield of grain.

WHEAT HARVEST RETURNS—SECTION A (NOT SUBSOILED).

Dressings per Acre.

Experimenter.	40 lbs. Ordinary Superphosphate.	No Manure.	56 lbs. Ordinary Superphosphate.	75 lbs. Ordinary Superphosphate.	No Manure.	16 lbs. Concentd. Superphosphate.	22 lbs. Concentd. Superphosphate.	No Manure.	30 lbs. Concentd. Superphosphate.	58 lbs. Thomas' Phosphate.	No Manure.	56 lbs. Ordinary Superphosphate and 28 lbs. Sulphate of Ammonia.	56 lbs. Ordinary Superphosphate and 30 lbs. Nitrate of Soda.	No Manure.	No Manure.	56 lbs. Ordinary Superphosphate and 56 lbs. Sulphate of Ammonia.	56 lbs. Ordinary Superphosphate and 60 lbs. Nitrate of Soda.	No Manure.	56 lbs. Ordinary Superphosphate, 28 lbs. Sulphate of Ammonia, and 28 lbs. Potash Chloride.	56 lbs. Ordinary Superphosphate, 30 lbs. Nitrate of Soda, and 28 lbs. Potash Sulphate.	No Manure.
Plot ..	1	2	3	4	5	6	7	8	9	10	11	12	13	14	17	18	19	20	21	22	23
ALLEE AND MALLEE FRINGE.																					
nes, D. B., Rainbow ..	21.6	18.5	20.5	20.8	19.8	17.9	19.5	17.3	19.0	19.8	18.1	19.5	21.8	17.2	17.4	18.0	19.1	18.1	18.2	18.8	17.6
len, J., Willenabrina ..	8.6	8.0	8.6	9.6	4.5	7.8	8.2	5.0	9.2	6.0	5.9	10.1	10.2	6.7	7.0	10.0	10.1	6.1	10.2	9.1	4.0
itney, J. B., Jeparit ..	6.0	2.6	10.0	7.3	2.8	5.8	5.8	2.9	8.1	4.5	2.8	7.1	6.5	3.1	2.8	8.6	9.8	3.5	6.5	8.3	5.0
lbourne, J., Wartacknabeal	18.6	12.3	20.5	19.0	10.6	18.5	19.0	10.6	19.3	10.3	9.0	17.6	15.6	9.3	9.0	13.6	14.3	8.6	12.6	13.0	5.6
very, B., Watchem ..	16.0	10.8	17.9	19.2	10.0	17.5	18.5	9.6	17.3	12.0	10.8	17.5	16.5	9.8	7.8	18.6	21.6	9.5	16.9	18.5	9.7
udge, J., Sea Lake ..	17.0	14.0	18.0	19.0	15.0	17.5	17.1	15.8	17.8	16.3	15.0	18.3	18.5	14.3	15.6	18.5	17.0	14.6	18.5	17.8	13.0
rber, A., Wyeneproof ..	7.1	9.0	12.6	13.3	10.8	15.0	15.1	12.5	17.1	13.6	12.1	13.6	14.0	9.8	10.0	12.8	11.8	9.5	12.6	12.3	10.3
illiamson, W., Boort ..	15.0	9.8	15.4	18.3	13.5	15.6	17.1	12.1	19.6	18.3	12.5	18.5	18.3	13.3	11.1	15.2	16.6	12.5	14.1	13.8	10.0
Average Yield per Acre ..	13.7	10.6	15.4	15.8	10.8	14.4	15.0	10.7	15.9	12.6	10.7	15.2	15.1	10.4	10.0	14.4	15.0	10.3	13.7	13.9	9.4
WIMMERA DISTRICT.																					
ery, J., Dimboola ..	15.3	9.1	17.3	17.5	10.5	16.0	16.8	10.1	19.3	12.1	10.0	16.2	17.0	10.1	12.1	17.8	18.3	13.0	17.0	17.1	11.1
bbins, E., Wail	17.8	14.1	20.0	20.5	13.0	15.6	17.6	10.3	20.0	18.3	10.5	18.8	20.3	12.6	11.6	20.0	20.3	13.3	21.0	21.6	14.6
watna, C., Jung ..	22.0	12.0	23.3	18.3	17.8	23.3	24.1	17.8	25.5	19.3	17.3	23.5	24.8	15.0	13.6	20.0	20.5	14.0	19.5	20.8	12.0
ppar, P., Coromby ..	18.3	16.1	21.1	22.5	16.5	20.5	22.1	16.8	23.1	17.1	14.8	20.8	21.1	15.0	14.6	19.8	20.3	14.3	19.0	20.8	15.5
itchings, A., Lubeck ..	29.3	23.6	29.6	33.3	23.3	27.3	34.1	22.3	34.0	27.3	23.3	30.5	30.6	20.0	23.6	27.3	30.0	22.6	31.3	32.0	22.3
Average Yield per Acre ..	20.5	13.1	22.2	22.4	16.2	20.5	22.9	15.4	24.3	17.6	15.1	21.9	22.7	14.5	15.1	20.9	21.8	15.4	21.5	22.4	15.1
ORTH AND NORTH-EAST PLAINS.																					
roat, W., Donald ..	22.6	18.5	20.8	18.6	15.1	21.7	23.5	18.8	24.5	21.3	19.8	23.5	24.3	21.0	19.6	24.0	20.0	18.5	22.1	21.8	16.3
xon Bros., Eddington ..	10.0	6.0	10.3	13.5	9.3	13.0	12.1	7.3	16.5	17.3	11.6	17.0	17.6	14.6	14.3	17.3	18.3	12.3	15.3	17.0	9.0
ward, J., Bet Bet ..	8.8	7.1	10.3	9.6	8.0	9.6	9.8	6.6	8.5	11.0	8.3	11.5	10.1	7.1	7.1	10.8	10.0	7.0	10.1	11.3	8.0
unter Bros., Elmore ..	29.0	20.6	31.1	27.0	24.3	25.3	29.3	20.0	30.6	24.6	24.3	27.3	32.3	22.0	25.3	28.6	32.0	23.3	30.0	28.0	20.0
ay, W., Merrigum ..	18.3	16.6	24.6	25.3	18.0	21.0	25.6	19.3	26.6	20.3	15.6	25.0	22.3	17.3	18.0	23.3	23.6	16.0	21.6	21.6	15.3
arp, T., Goorambat ..	19.3	18.0	23.6	22.6	17.1	20.6	20.5	16.1	20.8	20.6	17.1	22.0	22.8	16.5	18.6	24.6	25.7	17.3	22.0	23.1	18.6
Average Yield per Acre ..	18.0	14.4	20.1	19.4	15.3	18.5	20.1	14.6	21.2	19.1	16.1	21.0	21.5	16.4	17.1	21.4	21.6	15.7	20.1	20.4	14.5
Average for 19 Fields ..	16.8	13.3	18.7	18.6	13.6	17.3	18.7	13.2	19.8	16.0	13.6	18.8	19.1	13.3	13.6	18.3	18.9	13.3	17.8	18.2	12.5
Increase due to Manures	3.5	..	5.4	5.0	..	3.7	5.5	..	6.6	2.4	..	5.2	5.8	..	..	4.7	5.3	..	4.5	5.7	..

WHEAT HARVEST RETURNS—SECTION B (SUBSOILED).

Dressings per Acre.

Experimenter.	40 lbs. Ordinary Superphosphate.	No Manure.	56 lbs. Ordinary Superphosphate.	75 lbs. Ordinary Superphosphate.	No Manure.	16 lbs. Concentd. Superphosphate.	22 lbs. Concentd. Superphosphate.	No Manure.	30 lbs. Concentd. Superphosphate.	58 lbs. Thomas' Phosphate.	No Manure.	No Manure.
Plot ..	33	34	35	36	37	38	39	40	41	42	43	46
AND MALLEE FRINGE.												
). B., Rainbow ..	21.3	17.5	17.5	17.8	16.5	18.5	19.1	16.3	18.5	19.0	17.3	16.7
., Willenabrina ..	7.6	4.0	7.6	9.5	5.5	8.8	8.8	3.6	12.9	6.8	6.2	5.3
J. B., Jeparit ..	7.0	4.1	8.0	7.8	2.6	5.8	6.0	3.0	6.8	6.7	3.4	3.1
ne, J., Warracknabeal	11.6	6.0	13.0	15.1	6.6	11.6	12.6	6.0	15.6	6.6	7.0	5.6
B., Watchem ..	18.5	10.8	19.9	21.6	12.0	19.6	20.6	13.1	21.8	16.4	13.4	15.6
J., Sea Lake ..	17.3	16.1	17.0	19.3	15.0	17.0	19.3	15.1	20.6	16.8	16.0	14.5
A., Wycheproof ..	17.5	14.1	16.8	17.3	12.8	16.3	16.5	12.3	16.3	11.5	12.8	14.1
son, W., Boort ..	13.2	9.0	12.6	13.1	9.8	11.8	11.3	7.1	11.3	10.8	7.6	9.1
erage Yield per Acre ..	14.2	10.2	14.0	15.1	10.1	13.6	14.2	9.5	15.4	11.8	10.4	10.5
IMMERA DISTRICT.												
J., Dimboola ..	15.7	8.8	15.3	17.3	11.0	16.6	19.1	13.3	21.0	12.5	11.6	9.8
, E., Wail	21.5	14.6	21.6	22.5	12.6	18.6	21.3	13.3	22.0	14.0	14.0	14.0
a, C., Jung ..	15.5	10.0	17.0	19.5	11.1	17.8	17.8	10.1	19.1	13.1	7.8	11.6
P., Coromby ..	19.5	13.5	19.1	21.1	13.6	18.9	20.5	13.0	21.6	18.0	12.1	11.3
erage Yield per Acre ..	18.0	11.7	18.2	20.1	12.0	17.9	19.6	12.4	20.9	14.4	11.3	11.6
H AND NORTH-EAST PLAINS.												
W., Donald ..	22.3	20.8	23.3	24.1	20.6	23.6	24.0	21.0	23.1	20.6	20.1	20.8
Bros., Eddington ..	21.6	17.3	21.6	23.1	17.5	22.5	21.5	19.6	23.3	23.6	19.0	16.1
, J., Bet Bet ..	11.8	10.1	13.5	12.0	10.3	13.3	14.8	11.6	14.3	12.3	11.3	11.8
Bros., Elmore ..	22.6	21.6	26.6	20.6	25.3	28.3	28.3	23.3	28.0	22.8	24.0	19.6
V., Merrigum ..	25.3	[illegible]	27.0	26.0	22.0	25.3	25.0	19.6	27.3	23.6	16.3	16.6
P. R., Goorambat ..	22.6	18.0	22.1	23.3	18.6	24.7	23.5	18.3	25.0	24.3	18.0	17.1
erage Yield per Acre ..	21.0	18.0	22.3	21.5	19.0	22.9	22.8	18.9	23.5	21.2	18.1	17.0
erage Yield, 18 Fields	17.3	13.1	17.7	18.3	13.5	17.7	18.3	13.3	19.3	15.5	13.2	12.9
rease due to Manures	4.2	..	4.6	4.8	..	4.2	5.0	..	6.0	2.3	..	..

Experimenter.	56 lbs. Ordinary Superphosphate and 28 lbs. Sulphate of Ammonia.	56 lbs. Ordinary Superphosphate and 30 lbs. Nitrate of Soda.	No Manure.	56 lbs Ordinary Superphosphate and 56 lbs. Sulphate of Ammonia.	56 lbs. Ordinary Superphosphate and 60 lbs. Nitrate of Soda.	No Manure.	56 lbs. Ordinary Superphosphate, 28 lbs. Sulphate of Ammonia, and 28 lbs. Potash Chloride.	56 lbs. Ordinary Superphosphate, 30 lbs. Nitrate of Soda, and 28 lbs. Potash Sulphate.	No Manure.
Plot ..	47	48	49	50	51	52	53	54	55
AND MALLEE FRINGE.									
). B., Rainbow ..	17.2	18.5	16.5	17.5	17.7	16.7	18.2	19.0	17.0
., Willenabrina ..	9.3	11.6	6.1	12.5	12.2	9.4	11.8	10.0	4.3
J. B., Jeparit ..	7.5	8.1	3.5	7.5	7.0	3.3	7.2	8.0	5.5
ne, J., Warracknabeal	12.6	9.6	5.6	13.5	13.0	6.6	13.0	13.3	7.3
B., Watchem ..	22.5	22.3	13.3	23.6	23.4	15.4	20.8	20.8	12.8
J., Sea Lake ..	19.1	18.3	14.0	18.5	14.6	15.0	18.1	20.3	11.8
A., Wycheproof ..	17.6	15.8	13.6	16.5	15.8	12.8	16.1	16.3	13.0
son, W., Boort ..	14.8	14.3	11.0	14.1	12.6	8.6	15.0	15.8	9.7
erage Yield per Acre ..	15.0	14.8	10.4	15.4	14.5	10.9	15.0	15.4	11.1
IMMERA DISTRICT.									
J., Dimboola ..	20.0	19.3	13.6	22.1	12.0	19.0	19.4	23.8	9.5
, E., Wail	26.1	24.8	13.3	21.3	20.6	12.6	22.0	20.6	14.5
a, C., Jung ..	19.1	18.6	12.6	18.5	17.5	10.8	17.0	17.3	8.5
P., Coromby ..	21.1	20.8	11.8	21.0	20.3	11.1	19.8	21.5	12.8
erage Yield per Acre ..	21.5	20.8	12.8	20.7	17.6	13.3	19.5	20.8	11.3
H AND NORTH-EAST PLAINS.									
W., Donald ..	25.0	24.3	21.8	24.0	24.1	20.8	25.1	24.6	21.0
Bros., Eddington ..	22.0	21.3	17.3	20.8	22.0	18.3	22.0	22.1	14.0
, J., Bet Bet ..	16.0	15.5	11.8	17.0	17.0	12.3	15.6	16.0	11.3
Bros., Elmore ..	27.0	29.6	19.6	26.6	27.0	26.6	27.6	32.6	20.3
V., Merrigum ..	24.0	25.8	17.8	24.5	23.0	18.0	24.0	22.3	14.0
P. R., Goorambat ..	27.6	28.0	19.8	26.7	25.5	14.6	24.9	23.8	18.3
erage Yield per Acre ..	23.6	24.0	18.0	23.2	23.0	18.4	23.2	23.5	16.4
erage Yield, 18 Fields	19.3	19.3	13.5	19.2	18.0	13.0	18.7	19.2	12.5
rease due to Manures	6.4	5.8	..	5.7	5.0	..	5.7	6.7	..

CRITICISM OF THE RESULTS.

Space will not permit of more than passing reference to the salient features of the experiment, chief of which is the action of different amounts of the phosphatic manures both on the non-subsoiled and subsoiled land.

NON-SUBSOIL.

	Ordinary Superphosphate.			Concentrated Superphosphate.			Thomas Phosphate.
	40 lbs.	56 lbs.	75 lbs.	16 lbs.	22 lbs.	30 lbs.	58 lbs.
Mallee	13.7	15.4	15.8	14.4	15.0	15.9	12.6
Wimmera	20.5	22.2	22.4	20.5	22.9	24.3	17.6
North Plains	18.0	20.1	19.4	18.5	20.1	21.2	19.1
Average of 19 fields ..	16.8	18.7	18.6	17.3	18.7	19.8	16.0
Average Increase due to Manures ..	3.5	5.4	5.0	3.7	5.5	6.6	2.4

SUBSOIL.

	Ordinary Superphosphate.			Concentrated Superphosphate.			Thomas Phosphate.
	40 lbs.	56 lbs.	75 lbs.	16 lbs.	22 lbs.	30 lbs.	58 lbs.
Mallee	14.2	14.0	15.1	13.6	14.2	15.4	11.8
Wimmera	17.9	18.2	20.1	17.9	19.6	20.9	14.4
North and North-Eastern Plains	21.0	22.3	21.5	22.9	22.8	23.5	21.2
Average of 18 fields ..	17.3	17.7	18.3	17.7	18.3	19.3	15.5
Increase due to Manures ..	4.2	4.6	4.8	4.2	5.0	6.0	2.3

On the non-subsoiled land, it will be remarked, the most suitable dressing of the ordinary superphosphate is 56 lbs. per acre, while on the subsoiled land, although the differences between light, medium, and heavy dressings are not so marked, the same amount of manure has given the most economical results. Approximately, corresponding amounts of phosphoric acid, supplied in the forms of concentrated superphosphate and Thomas' phosphate, have, particularly in the case of the latter, given less satisfactory returns.

THE ADDITION OF NITROGENOUS MANURES TO THE SUPERPHOSPHATE.

The possibility of the ultimate need of northern soils for nitrogen, in addition to the usual phosphatic dressing, is a matter that has already received attention at the hands of previous experimenters, and the pleasing

fact that up to the present time the demand is not noticeable is clearly borne out by the present results.

SUPERPHOSPHATE ALONE VERSUS SUPERPHOSPHATE AND NITROGENOUS MANURES COMBINED.

NON-SUBSOIL.

—	Plot 3. 56 lbs. Superphosphate.	Plot 12. 56 lbs. Super.; 28 Sulp. of Ammonia.	Plot 13. 56 lbs. Super.; 30 Nitrate of Soda.	Plot 18. 56 lbs. Super.; 56 lbs. Sulp. of Ammonia.	Plot 19. 56 lbs. Super.; 60 lbs. Nit. Soda.
Mallee	15.4	15.2	15.1	14.4	15.0
Wimmera	22.2	21.9	22.7	20.9	21.8
North and North-Eastern Plains	20.1	21.0	21.5	21.4	21.6
Average of 19 fields ..	18.7	18.8	19.1	18.3	18.9
Increase due to Manures	5.4	5.2	5.7	4.7	5.6

SUBSOIL.

—	56 lbs. Ordinary Superphosphate.	56 lbs. Ord. Super.; 28 lbs. Sulp. Am.	56 lbs. Ord. Super.; 30 lbs. Nit. Soda.	56 lbs. Ord. Super.; 56 lbs. Sulp. Am.	56 lbs. Ord. Super.; 60 lbs. Nit. Soda.
Mallee and Fringe ..	14.0	15.0	14.8	15.0	15.4
Wimmera	18.2	21.5	20.8	20.7	17.6
North and North-Eastern	22.3	23.6	24.0	23.2	23.1
Average of 18 Fields	17.7	19.3	19.3	19.2	18.0
Increase due to Manures	4.6	6.4	5.8	5.7	4.1

On the non-subsoiled land the effect of the additional nitrogen has been to produce slightly more wheat per acre, but still far too little to compensate for the extra expense. On the subsoiled land there is a little better improvement in the yield, but not enough to make the additional nitrogen profitable.

THE ADDITION OF POTASH TO THE OTHER MANURES.

Wheat is a plant that needs potash least of all the plant foods, and what there is used will mostly be found in the straw. The following results show that the northern soils do not respond to this ingredient, and its absence in the manure dressing need give the wheat farmer no concern.

From this comparison it is not difficult to see that the additional potash, either as chloride of sulphate, has not only failed to produce an extra yield, but has in the Mallee and Wimmera even caused a slight falling-off from

the yield of grain produced by the superphosphate alone. Of the two forms of potash the sulphate appears to offer the better possibilities.

NON-SUBSOIL.

	Plot 3. 56 lbs. Super.	Plot 21. 56 lbs. Super.; 28 lbs. Sulp. Am.; 28 lbs. Pot. Ch.	Plot 22. 56 lbs. Super.; 30 lbs. Nit. Soda.; 28 lbs. Pot. Sulp.
Mallee	15.4	13.7	13.9
Wimmera	22.2	21.5	22.4
North and North-Eastern Plains ..	20.1	20.1	20.4
Average of 19 Fields ..	18.7	17.8	18.2
Increase due to Manures ..	5.4	4.5	5.7

SUBSOIL.

	56 lbs. Super.; 28 lbs. Sulp. Am.	56 lbs. Super.; 30 lbs. Nit. Soda.	56 lbs. Super.; 28 lbs. Sulp. Am.; 28 lbs. Pot. Chloride.	56 lbs. Super.; 30 lbs. Nit. Soda; 28 lbs. Pot. Sulphate.
Mallee and Fringe	15.0	14.8	15.0	15.4
Wimmera	21.5	20.8	19.5	20.8
North and North-Eastern Plains	23.6	24.0	23.2	23.5
Average of 18 Fields ..	19.3	19.3	18.7	19.2
Increase due to Manures	6.4	5.8	4.8	6.7

SUMMARY.

The manurial tests involved in the experimental fields necessarily depend on the results of several years before the irregularities caused by soil and season inequalities disappear, and the salient points are confirmed. There is, however, sufficient material in the harvest returns of the first year to make clear to all persons interested in the the experimental work, that the manurial problems of the northern wheat districts are not likely to be adequately solved by a rigid adherence to any conservative method of cultivation or use of manures. It is quite probable that as the experiments mature certain types of soil will group themselves, within limits, to prove the efficiency of special classes and amounts of manure. Special methods of cultivation will probably show better results on some types of soil than on others. In my opinion the Field Branch of the Department of Agriculture will do useful service to the State in ascertaining and collating the various points made manifest from year to year, so that sound principles may be established to which the wheat farmer may look for guidance. Although much has been done in this direction, more remains yet undone.

The results of the first year may be said to point out:—

(*a*) The superiority of superphosphates over other forms of phosphatic manures.

(*b*) That about 56 lbs. per acre has given better yields than lower or higher amounts, and is also the most economical amount to use from the point of view of cost.

(*c*) That up to the present time the northern wheat soils, particularly those of the Mallee and Wimmera, do not show any response to nitrogenous manures. The northern and north-eastern plains show a slight response, but hardly sufficient to cover the extra cost of the manure.

(*d*) That manures containing potash have rather a depressing effect on the yield of grain, and may therefore with safety be left out of consideration for some time to come.

(*e*) That while the average results of subsoiling are somewhat disappointing, a complete explanation can be found in the fact that the deep cultivation was carried out too late in the season to show any but a slight effect in the first year.

(*f*) That the northern and north-eastern districts show a better response to subsoiling than the Mallee and Wimmera, where the rainfall is smaller.

(*g*) That there is an indication that subsoiled land responds better to light application of manures than does land cultivated in the ordinary way.

(*h*) That subsoiled land may be relied on to germinate the seed more rapidly, maintain a more continuous and vigorous growth, and permit of a better formation of heads than non-subsoiled land.

(*i*) That where land has become foul with wild oats, subsoiling appears to assist germination, which in the fallow year enables the land to be thoroughly cleaned.

(*j*) That wheat grown on subsoiled land makes a more vigorous growth of straw, and does not ripen as quickly as on land not so treated.

CONCLUSION.

In concluding this *résumé* of my Report on the Experimental Yields, I desire to again emphasize the need for caution in any consideration of the returns. This should be especially the case with the subsoiling trials, which will require at least another year's test before we can hope to establish any guiding principles for future work. That the farmer cannot contemplate with equanimity any increase in the cost of production I am well aware, but it is worth while noting that improved methods of cultivation will not entail any further cash outlay, and as time progresses the accompanying benefits of healthy weed-free crops will reconcile him to the small amount of increased labour.

THE LESSONS OF A DRY SUMMER.

T. Cherry, M.D., M.S.

Throughout the whole of Victoria the last summer has been unusually dry and hot. In the northern districts weather of this kind is more or less expected. Agriculturalists have adapted their methods of farming to meet three or four months without rain, and have made the requisite provision for watering their live stock. Rain, during the months of December

or February, is generally looked upon as a disadvantage in the north, as it starts the growth of the grass, while the young plants a few weeks afterwards are withered up. The consequence of a large proportion of the seeds, which are lying dormant in the ground, thus germinating too early, is a poor growth of herbage during the autumn months. The ordinary routine work, and the expectations of the northern farmer generally provide for a long spell of dry weather. The case, however, is different in the southern districts. Summer fodder crops, grown without irrigation, are required for the progress of every district where the dairying industry has taken a firm hold. Potatoes and other root crops depend for their

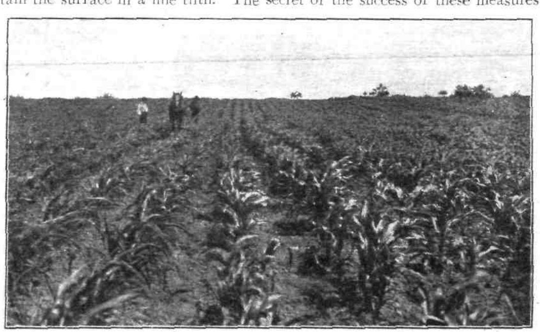
1.—CULTIVATING MAIZE AT "THE CURRAGH," DANDENONG. THREE WEEKS FROM SOWING.

success upon obtaining an average amount of moisture during the early part of the summer. This year's experience has therefore been an exceedingly trying one; and it is worth while seeing what can be done in order to guard against a similar experience in the future.

BRAINS VERSUS RAINS.

While the growth of grass in the southern districts has been at a standstill during the summer, farms which have been brought into good working order, and which were not over-stocked, have come through the drought with a fair amount of dry feed for all the live stock. It is the absence of green succulent food, which is being most acutely felt; and the absence of this kind of herbage is very distinctly reflected in the returns from all the chief butter factories of the State. December opened well with an increased output over the corresponding month last year. Towards the middle of January supplies began rapidly to fall off, and during February they fell far below the average for this time of the year. An extension of the season for two months would have meant an extra £200,000 added to the wealth of the State. The potato crop—the one

in which most farmers are chiefly interested—has suffered in the same way. The summer fodder crops have been almost complete failures. Yet, as will be seen from our illustrations, a few farmers have managed to grow fairly good fodder crops even without any rain, and it is worth while to inquire into the methods by means of which these results have been accomplished. Taking maize as a type of the summer fodder crops, we find that this year successful crops have been sown on well-prepared land that has been treated with artificial manures, and in most cases with farm-yard manure as well. The crops have been planted in drills, and the space between the drills steadily and regularly worked, so as to maintain the surface in a fine tilth. The secret of the success of these measures



2.—SIX WEEKS FROM SOWING.

is to be attributed to the fact that they are the most effective means of conserving the moisture of the soil. Carefully preparing the ground by ploughing it deeply during the winter, and working it into a fine tilth with the harrows and roller early in the spring, insures a much larger supply of moisture for the roots of the growing plant than is possible in the case of a badly-prepared field. Sowing superphosphate at the rate of about 1 cwt. to the acre, along with seed, insures that the most important part of the food substance for the little plant is readily available. Consequently the young crop makes a vigorous start. Harrowing the surface of the field and, as soon as the plants are a few inches above the ground, beginning a systematic course of cultivation between the rows, keeps the surface in a fine tilth, and prevents evaporation of water, while at the same time it keeps down the growth of weeds, which otherwise would monopolize a considerable proportion of the moisture, instead of allowing the whole of it to be appropriated by the crop. By these means, maize crops have been enabled to hold their own during the months of January and February, and to start forward again in their growth with the rain which fell in the first week of March. In some cases, however, satisfactory crops have been grown which were planted after the previous rain in the beginning of December, and had therefore during the whole of the months of December, January, and February kept growing without

a single drop of water. The legends attached to our illustrations will explain the history of each of these crops. I believe that this season every crop of maize sown broadcast has resulted in failure.

Another way in which the effects of a long drought can be obviated is by the provision of silage in sufficient quantity to carry the dairy herd through the whole of the summer without the assistance of green food. This plan involves the growing of a larger quantity of oats or other cereal in the winter, and using part of it for silage, instead of cutting the whole of it for hay. An up-to-date farmer should combine winter silage with

3.

4.

THE SAME CROP TWELVE WEEKS AFTER SOWING. NO RAIN.

summer crops. Fill the silo first during the month of November with a cereal crop, and feed this to the cows during the dry weather in summer. Grow a crop of maize to fill the silo a second time, and utilize it for winter feed for the dairy herd. This method has been very successfully adopted at Boisdale, where twelve large silos, with an aggregate capacity of about 3,000 tons, have been erected within a couple of miles of the butter factory.

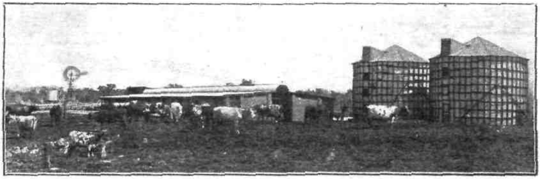
NOTE BY S. S. CAMERON, M.R.C.V.S.

The maize crop, illustrated in Figs. 1, 2, 3, and 4, was sown from 10th to 15th December, 1905. The land was ploughed in the spring, and left fallow to mellow and absorb the rains. After the rains, in early December, it was ploughed 4 inches deep, maize being sown along the bottom of every fourth furrow, giving a distance of 2 feet 6 inches clear

between the rows. The land was then harrowed and rolled. The cultivator was run through between the rows immediately on the plants showing above the ground (Fig. 1), and thereafter every fortnight or three weeks (see Fig. 2). Although no rain fell from 9th December to 9th March, the crop ranged from 5 feet to 7 feet 6 inches high at twelve weeks from sowing, as shown in Figs. 3 and 4. This result was doubtless largely due to the systematic cultivation to which it had been subjected, whereby a 'mulch' of dry loose soil was maintained, and evaporation of moisture thereby prevented.

The Progress of the Silo.

The following notes by R. T. Archer, dairy supervisor, are of interest at the present time :—I recently visited several of the farms on the Boisdale Estate, where silos have been erected, and you will be interested to know that the results this season so far have been very satisfactory.. Six of the "share farmers" have two silos side by side. An error was made in the dimensions, which are 24 feet in diameter by 18 feet high, instead of 24 feet high by 18 feet in diameter; the consequence being that too great a surface is exposed at once, and part of the exposed surface moulds



150-ACRE FARMSTEAD, BOISDALE.

before it can be used. These silos were filled with oats in December, some of the crops being almost dry enough to thresh before being cut owing to unavoidable delay, but when opened this was quite soft and succulent, and proved very satisfactory feed.

On looking through the milk sheets at the factory, it was easy to see who are feeding their cows. The milk supplied to the factory was in most of these cases greater in quantity at the end of February than in December, while those who were not feeding had decreased by half. One farmer (milking 40 cows), the second day after starting feeding silage, delivered 14 gallons more milk, another increased still more, and the cows being kept in full milk during the dry months insures their milking well now the autumn rains have come, when a plentiful supply of grass through the winter is assured.

On my way I saw a stack of maize silage, the owner of which, one of the tenant farmers on the Boisdale Estate, was just carting out a load to the cows. The maize was cut too green on account of caterpillars getting into it. It was bound by a reaper and binder, stacked in the sheaves in a round stack, the sides pared to leave them as even and solid as possible, the result being only about six inches of waste round the outside at the top, and there would be less at the bottom. The top was covered by bags and weighted with posts, and when the bags were removed

there was not an inch of waste on the top. The cows ate the silage greedily. The same practice was adopted last year with the same satisfactory results. The silage came out as green as it went in, and the same right through.

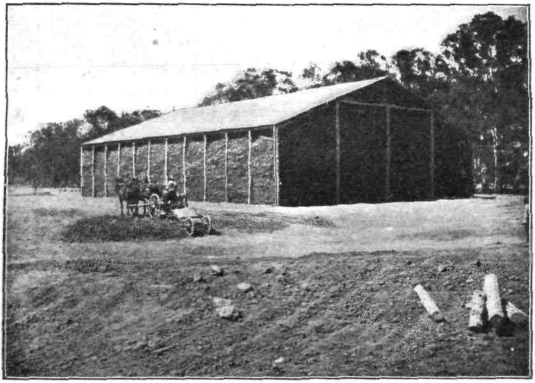
Since visiting Boisdale I was in the Colac District, where the value of the silo is being proved, Mr. Colin Tulloch being one of the first to adopt the use of them. Mr. Tulloch told me that on one of the farms, 416 acres, he milked 140 cows, and received £1,440 for milk from the Colac Butter Factory Company for the year 1905, an average of £10 5s. 8d. per cow, in addition to which £300 resulted from pigs and calves. The silo is credited with being to a considerable extent accountable for these

TWO MONTHS' GROWTH. NO RAIN.

good returns. Sometimes it is not easy to obtain the use of a chaff-cutter when the crop is ready for silage, and Mr Webster, of Pirron Yallock, I am told, filled his silo this year with green oat sheaves with satisfactory results. Certainly, if the silo has to be filled with long stuff, it is more conveniently handled in the form of sheaves. If carefully packed, the outsides being kept about three feet higher than the middle, and well trampled, the feeding results are good.

In filling a silo with sheaves, it should be borne in mind that we require to get as much lateral pressure as possible, the fodder to be closely packed as near as possible to the iron lining of the silo, in order to press out the air. To obtain this end it is necessary to adopt a system of stacking the opposite to that in building a stack, laying the sheaves lengthwise against the iron, and packing it all in this fashion so as to bind them as little as possible.

The use of the silo is gradually coming into favour all over the State, and at Nhill several have been built and filled this season, principally with oats, barley, or native grass. The object is to provide succulent food for lambing ewes, just when all the grass is dry. Mr. Dahlenberg has opened and fed a good part of the contents of his silo to cows, and is highly pleased with the results, so much so that he has decided to build several more. Mr. Edwards showed me some of his silage, which, though rather dark in colour, is very sweet and good. Owing to a good rainfall he will not require to use it this season. An impression is prevalent that if silage is not used the season it is made it will be no good, but this is



INSURANCE AGAINST THE NEXT DROUGHT.

Sir Samuel McCaughey has 1,000 tons of lucerne hay at North Yanko as an insurance against drought. After the shed has been filled, a ditch 16 feet wide x 6 feet deep is excavated, and filled with water. This serves to keep mice away, and the tramps cannot get close enough to set fire to the shed.

a mistake. Provided the air is kept away, it will keep good for practically any length of time. Mr. Bond, an old settler in the Nhill district, has been handling silage for ten or eleven years, and when he has not required all the silage in a pit or silo he has filled up again, and that which was left over was quite good when he came to use it another year. Mr. Robinson, of Warracknabeal, told me he has proved the same thing. He won a gold medal, given by Messrs. Cuming, Smith, and Company, for the best silage. The silage was not required for feeding at the time, and he was advised not to open it, but he did, and obtained the medal, then closed it up again until the following season, when it turned out as good as before.

One mistake I notice in filling several of the silos is that the stuff has drawn away from the sides, so letting the air down between the silage and silo, in which case there is considerable waste. This is due to the fact that the middle is kept too full, and the sides not full enough, nor yet

trampled enough. The weight of the silage from the elevator continually falling in the middle is almost sufficient to insure consolidation at that part, and the outside should be kept at least three feet higher than the middle, and well trampled. I also feel sure that it would pay to have planks cut the shape of the silo to lay on the top to exclude the air, and on the top of these planks to place weights, either in the shape of posts, sleepers, bags of sand, or whatever is easiest to handle.

Another mistake is sometimes made in making the silo too great in diameter. This should be proportionate to the number of animals to be fed. King gives the following table as furnishing the best guide as to the diameter of silo, which insures sufficient being removed from the surface daily to prevent any going bad:—

		Feeding Surface.		Inside Diameter.
30 cows	...	150 square feet	...	14 feet.
40 cows	...	200 square feet	...	16 feet
50 cows	...	250 square feet	...	18 feet.
60 cows	...	300 square feet	...	$19\frac{3}{4}$ feet.
70 cows	...	350 square feet	...	$21\frac{1}{4}$ feet.
80 cows	...	400 square feet	...	$22\frac{3}{4}$ feet.
90 cows	...	450 square feet	...	24 feet.
100 cows	...	500 square feet	...	$25\frac{1}{4}$ feet.

I have not met any one yet who has tried silage and is not thoroughly satisfied with the result.

THE ORCHARD.

James Lang, Harcourt.

Gathering in the crop of apples and pears will be the principal work of the orchard during April. In the early districts all varieties should be gathered by the end of the month, but in the late districts they can hang a couple of weeks longer. Be careful in picking fruit intended to be stored, as rough usage in handling soon leads to decay. Apples and pears should be handled as carefully as eggs. Most of the loss by decay in fruit stored can be traced to rough usage in picking; great loss is also occasioned by allowing the fruit to remain too long on the trees. As soon as the fruit matures it commences to drop freely, and if not gathered at once a great portion of the crop falls to the ground. It is therefore better to pick apples and pears intended for keeping a little on the unripe side, and so avoid loss by the fruit dropping. If it is intended to store any of the apples or pears in a cool store, they should be delivered at once. On the whole, the crop of late apples will be very light, and, taking into account the shortage in Tasmania, prices before the end of the winter will rule higher than they have done for several years past.

Manure should be carted out and spread; soil, road scrapings, cleanings from drains, and vegetable refuse of all kinds should be collected and agated into the orchard, as they all help to make valuable manure. The little summer has been unusually dry, especially in the districts surround-

ing Melbourne, where the rainfall during the summer months is generally ample to properly mature the fruit. The past season has, however, been the exception, with the result that the fruit has not grown as large, or matured as well as usual. Consequently orchards that could be irrigated have had a great advantage over those where no water was available. Orchardists who can make provision for conserving water should, therefore, not neglect to construct tanks and dams on their holdings in suitable places where water can be gathered. The watershed of a dam may be enlarged by constructing storm-water channels to lead into the dam. A good supply of water makes the grower, to a certain extent, independent of the weather, as he can always give the trees a soaking when they require it. It makes a great difference to the fruit when it is grown throughout the season without a check, as it then properly matures, and comes a good colour. The tree is also left in better condition for the next year's crop of fruit.

This is the best time to plant citrus fruits, as the ground being warm and moist they soon root. Shorten back the head when planting, and should the weather be dry, give a good soaking of water.

As the winter is usually a slack time with orchardists, advantage should be taken of the opportunity to look over the fences and effect necessary repairs where required; also clear out drains, so that they will not choke when heavy rain falls.

DISEASES OF FARM ANIMALS.

S. S. Cameron, M.R.C.V.S

III.—CAUSATION OF DISEASE.

In attempting to combat any given disease the determination of all possible causes of that disease is highly necessary, because successful treatment so largely depends on ability to remove or counteract the cause; and the axiom, "Remove the cause, and the effect shall cease," ascribed to one of the earliest medical writers, although not wholly true, should always be borne in mind.

The causes of disease have in times past been differentiated as *predisposing causes* and *exciting causes;* and, although the line of demarcation between the two cannot be very exactly defined, and has, by recent discoveries and modern methods of research, been made more obscure, the division may still be allowed to serve. It must, however, be understood that many of the conditions which will be indicated and described as predisposing causes may, when brought to bear with sudden force, or when operative over a lengthened period, act as exciting causes of disease.

Predisposing Causes of Disease.

There is some difference between *predisposing causes* of disease and *predisposition* to disease. The former are factors or circumstances, unconnected primarily with the animal, which render it susceptible to contract

disease more readily than it otherwise would, and include such circumstances as climate, locality, food supply, and nature of activities. A predisposition to disease, on the other hand, is a condition possessed by an animal, which renders it vulnerable to the attack of more direct causes of disease. Hereditary weakness, conformation, breed, age, and temperament, are examples of such inherent conditions. But for practical purposes the whole of the circumstances or conditions which tend to increase the liability to disease, whether brought to bear extrinsically or possessed by the animal intrinsically, may be considered together.

CLIMATE.

The climate and meteorological conditions prevailing, not only in different countries, but also during different seasons of the year in the same country, are well known to have an effect on the liability of both animals and man to disease; and this, apart from the much-experienced effect of change of climate (*i.e.*, removal to a different climate), which, in many cases, may be considered as an exciting cause rather than a predisposing one. The widely held notion that the blood becomes thinner after continued sojourn in a hot climate, and is thicker in cold countries is erroneous. That the circulation of the blood may be more sluggish in cold countries than in hot, where the temperature influences function-energies, may be admitted; but that the blood itself is altered in composition, consistence, specific gravity, or fluidity, cannot be scientifically contended.

The circumstances which determine the influence of climate on causation of disease are not well understood, but in recent years light has been thrown in some directions on the subject. Many of those sub-tropical diseases, of which malaria is a type in man, and, say, red-water and South African horse-sickness in animals, are now known to be caused by micro-organisms, which are transmitted to them by the medium of certain insects, such as mosquitos and ticks; so that their occurrence cannot be said to be directly due to climatic influences. Indirectly, however, they are, for the disease-conveying insects only flourish in latitudes where the temperature and atmospheric moisture are such as to favour their development.

The direct effect of *atmospheric temperature* is noticeable as a factor in disease. Apart from disease incidence due to sudden exposure to sun heat, long continued excessive heat induces debility and loss of tone and functional energy, leaving the system more open to attack by disease-producing agents. Conversely, the advent of frost, or excessively cold weather, may cut short outbreaks of microbian disease. On the other hand, long continued exposure to cold undoubtedly tends to lower vital energy, and so predisposes to disease. It has been frequently observed in America that the greatest prevalence and mortality of swine fever occurs in the southern States during the summer, and in the northern States during the winter months; periods when the conditions of temperature and climate are such as to diminish the natural or physiological resistance to disease.

Lung affections are much more prevalent in low-lying situations, with a moist foggy atmosphere, while horses and cattle reared at high altitudes, where the air is more rarefied and dry, are well known to have more hardy disease-resisting constitutions.

LOCALITY.

Certain diseases are observed to be more prevalent in some districts than others, and the increased prevalence can, in a number of instances, be shown to be due to local conditions of soil and weather, or to localized customs of management. Fluke in sheep only prevails on low, marshy, or wet land, suitable for harboring the particular kinds of fresh water snails (physae), which are essential to certain stages in the life of the fluke parasite. In like manner anthrax, rheumatic affections, dysentery, Australian stringhalt, and intestinal parasites, occur mostly on similar country. Foot-rot in sheep is known to be of most frequent occurrence on very wet land, with a clay subsoil, or on dry gravelly country. Sand colic, impaction and paralysis of the bowels in horses are more prevalent in dry sandy localities, where the soil is devoid of surface humus. In the wind and rain-swept gullies and ranges of Gippsland, and other hilly country, febrile diseases, colds, bronchitis, and other lung affections are more severe than in less tempestuous localities, and when contagious or infectious diseases, such as pleuro-pneumonia, swine fever, and strangles, obtain a footing in such districts, their spread is more rapid, and they are more fatal. In Australia the disease of horses know as "nasal disease," which is really a form of osteoporosis, is noticed to be more common in certain localities, as is also goitre and rickets in sheep. Similarly "coast disease" or "cripples" when first of a character to demand attention, was almost confined to the coastal districts.

SOIL EXHAUSTION.

The subject of soil-exhaustion, which is destined to loom largely in connexion with the health and well-being of stock in Australia, may be given brief attention here, for it is, in a great measure, a question of local stock management or agricultural customs. Ever since shortly after the sheep industry got firmly planted throughout Australia, it has been known that certain tracts of country would become, after a shorter or longer lapse of time, "sheep sick," and now, at the end of fourteen or fifteen years from the establishment of the dairying industry some areas, in Victoria at least, are suspected of being "cattle sick." This means that the virgin land, through continuous grazing without manurial or cultural assistance, has become deficient in certain mineral constituents, and that consequently those plants, to the growth of which such mineral matters were essential, have died out, and plants of inferior quality, so far as milk production (or, in the case of sheep, wool production) is concerned, have taken their place. In other words the grazing of one class of animal on the same land for a number of years has almost completely altered the character of the herbage, and while the pasturage may *look* as well as ever, and may *be* as good for grazing another class of animal, its "substance" for the purpose for which it has been used, has vanished. It is estimated that the amount of nitrogen lost to the soil by means of milk removed from the farm averages 45 lbs. per cow per annum; of phosphoric acid and potash from 6 to 9 lbs. each. Taking even good land that will carry one cow to 3 acres, it will be seen that the land is being exhausted at the rate of 15 lb. of nitrogen, and 2 to 3 lbs. of phosphoric acid and potash per acre per annum.

Throughout a period of prolonged drought, this form of soil-exhaustion is more quickly effected. Most of the chemical elements which form the mineral food of plants exist in some form, and in minute quantities, in the air, and may be brought down and supplied to the soil by means of rain. The amount of nitrogen in the form of ammonia that is carried to the soil by rain in country districts during an ordinary season is equivalent to 44 lbs. per acre per annum. In the neighbourhood of towns a greater amount is deposited, and therefore it is not in respect of nitrogen that the soil becomes exhausted. But phosphoric acid, in the form of phosphate of lime, is deposited by rain to the extent of only half a pound per acre per annum; so that the deficiency produced by grazing milking cows is not made up for naturally, and exhaustion of this essential soil constituent goes on at the rate of at least 2 lbs. per acre per annum—an amount equivalent to 10 lbs. of 20 per cent. superphosphate. In dry seasons the adventitious supply of mineral matter, by means of rain, fails, and the deficiency becomes more pronounced.

OVERSTOCKING.

The subject of overstocking may be here briefly adverted to. Apart from the ill effects of continuous grazing just mentioned, and which become much increased when paddocks are overstocked, and apart also from the actual fouling of the herbage by excess of animal discharges, and by "the tramping of many feet," there is the further disadvantage that the good grasses are continuously eaten off as they shoot into growth, and are thus prevented from seeding. In this way the extirpation of much wholesome herbage is hastened. At the same time, useless or actually harmful and noxious plants which are not eaten by stock until the pasture is bare of nutritious grasses, are allowed to seed, until eventually the innutritious herbage predominates, the good grasses having been eaten out. A familiar instance is the gradual usurpation of a pasture by Yorkshire fog grass (*holcus lenatus*) where this grass has been sown with sweeter grasses; the latter are eaten down continually, while the fog is neglected by stock owing to its harshness, and being a strong grower, it soon takes possession of the pasture. Again, the well-known rib-grass or plantain (*plantago lanceolata*) being much relished by sheep, is a useful grass on sheep country; cattle, however, neglect it, and on cattle runs it quickly becomes a nuisance, not only on account of its spread, but because its flat habit of growth entails great waste of ground surface that could otherwise be utilized by more suitable grasses. Even in times of plenty, the folly of overstocking is not less acute, for then the noxious plants are left still more severely alone to propagate and spread their baneful presence over the pasture, occupying ground that would otherwise accommodate herbage of more nutritious character.

Truly the factors operating towards deterioration of Australian pasture lands are many, and deserve thoughtful attention and action on the part of all concerned. At the risk of being charged with uttering a libel on the common sense of Australian farmers, a protest must be here entered against the suicidal and wasteful practice of burning off seeding grass during bountiful seasons, a practice which is carried out by not a few farmers in some highly-favoured districts. They fear bush fires, and instead of mowing the super-abundance of seeding grass, and turning the into hay or ensilage, as a standby for a time of scarcity, they thoughtlessly resort to the characteristically improvident method of the "fire stick."

ENVIRONMENT.

Unwholesome surroundings may, according to their character and intensity, be such as to excite disease or predispose the animal to an attack. Vitiated atmosphere, as a result of deficient ventilation and perflation, is often a contributory cause of pneumonia, influenza, and other debilitating diseases in stabled animals. So noticeable is the effect of insanitary surroundings on the occurrence and spread of certain diseases, that it has become customary to group them together under the term "filth diseases." By this is meant, not so much that filth in itself will cause these diseases as that their causative germs will find in the unclean surroundings—deposits of dung, manure, and rubbish, stagnant drainage, and the like—ideal conditions for maintaining germ life. As instances of such filth diseases, Tetanus (lockjaw), and influenza in horses, anthrax and abortion in cattle, swine fever and fowl cholera may be mentioned.

Want of cleanly surroundings, especially of working horses, encourage skin diseases, such as mange, eczema, psoriasis (mallanders) crackled heels, mud fever, and grease. "Foul in the foot" of cattle, and foot-rot in sheep are other cases in point.

Want of shelter from cold and rain or *want of clothing*, by preventing the conservation of bodily heat, and *want of shade* from excessive sun heat by retarding radiation of bodily heat, all influence the natural vigour of the animal prejudicially, and so predispose to disease.

SPECIES OR KIND.

Certain diseases are peculiar to certain kinds of animals. Animals of the cattle tribe are alone liable to contract contagious Pleuro-pneumonia, Tick fever, Black leg, Milk fever, and Rinderpest. Strangles, Roaring and Stringhalt are peculiar to horses, and no animal but the dog is ever affected with Distemper; while Swine fever, Multiple abscess (*lymphadenitis*) and roup are examples of disease, which are confined to pigs, sheep, and fowls respectively. In addition to typhoid fever, syphilis, and appendicitis, a whole host of diseases could be mentioned to which man alone is liable.

Conversely, certain diseases never affect certain kinds of animals. Cattle are completely exempt from Glanders, horses from Foot-and-mouth disease, dogs from liver Fluke, sheep from Purpura, and pigs from Redwater. Donkeys, mules, and goats are peculiarly insusceptible to most of the diseases which ravage the closely allied species—horses and sheep. Thus donkeys seldom suffer from any of the bony affections which are so common in horses, and they, as also goats, are practically immune against Tuberculosis, Anthrax, and like virulent affections of closely- elated species. Such diseases, as Foot-and-mouth disease in cattle, Glanders in horses, Rabies in dogs, and Fluke in sheep, while being primarily bovine, equine, canine, and ovine diseases respectively may also affect other species, but in such cases the attack is frequently much modified in type, and milder in form.

Frequently anatomical and physiological differences may determine the incidence of diseases peculiar to a species as in the case of appendicitis in man, Sidebones and Roaring in horses, and Foot-rot in sheep; but

what the influence is which determines the incidence on particular species of animals of the diseases mentioned in the last but one preceding paragraph, is not satisfactorily known. Some light has been thrown on this aspect of the incidence of diseases by recent researches on the subject of immunity whereby it may be speculated that differences in chemical composition and physiological affinities of the component parts of blood cells and blood serum of different animals may account for the susceptibility of some species over others to special diseases. This subject will be more fully discussed under the heading of "Immunity"; but it may here be said that the most hopeful prospects of elucidating the problem lies in those directions to which serum-study leads.

BREED AND TYPE.

Certain types or breeds of horses are markedly susceptible to particular forms of disease. Weed or "shot of grease" (*lymphangitis*), chronic greasy heels and canker of the feet are seldom seen in other than coarse skinned and heavy-legged draught horses. Amongst light horses, cracked heels are usually only met with in coarse-bred and fleshy-heeled specimens, and but seldom in clean-boned fine-skinned horses claiming thorough-bred descent. Navicular disease is rare amongst cart horses, though it is a common enough affection of light-bred animals. Amongst other animals the proneness to milk fever of deep milking types and breeds of cattle may be adduced in this connexion; and in Australia it has been observed that the disease of the lymphatic glands of sheep called multiple abscess, or lymphadenitis, is largely confined to "comebacks." In sheep, it is the lightly-bred merino and other fine-wooled types that more quickly qualify for the "foot rotting" paddock, while the liability of line-bred shorthorns and other pedigree cattle to contract all and sundry constitutional affections is notorious.

CONFORMATION.

Many instances of conformation predisposing to disease could be mentioned, but a few will suffice. Ponies are rarely roarers; it is the long-necked and fine-throated horses that usually develop this disease. On the other hand, ponies and round-barrelled horses of all sorts appear to be prone to broken wind; while those of the opposite build—"herring-gutted" horses—are well-known to be bad doers and liable to attacks of diarrhœa and other forms of indigestion. The association of sickle-hocks with curb, of calf knees with brushing and speedy-cutting, of sloping pasterns with break-down, of upright pasterns with ringbone, fetlock soreness (*arthritis*), and knuckling over, and of narrow upright muley feet with navicular disease, are more than mere coincidence; they are oftentimes cause and effect.

COLOUR.

While the truth of the old saying that "a good horse cannot be a bad colour" may be admitted, there is ample justification for the statement that horses of good colour have more robust constitutions and are less liable

to disease than "off-coloured" ones. By "good" colour is meant that, no matter what shade, it should be distinctive and pronounced. Brown, with tan muzzle, bay with black points, dapple and fleabitten grey, and dark or liver chestnut, are favorite colours, and are characteristic of many great families, amongst which the grey "Snowdens," the brown "Smugglers," and the ticked-chestnut "Sir Hercules" descendants are still famous in the land, not so much for their colour as for the hardy family characteristics which accompany it. Mealy bays or browns with rusty manes and fawn legs; washy chestnuts with yellow mane, tail and leg-feathering; and light mushy roans, are types of bad coloured horses frequently met with, and almost as often found to be soft and skittery, full of funk, and without "bottom."

The absence of pigment in the skin would appear to have *some* influence in determining disease. Hoofs and horns are appendages of the skin, and when white (*i.e.*, unpigmented), they are found to be more brittle, weaker, and more liable to disease than when coloured with pigment. Certain skin eruptions are more pronounced on white cattle and white dogs, and on the white patches of piebald horses; and cracked heels and grease are much more prevalent in white stockinged horses than in those with black points. In the latter case the influence of colour in causing the trouble is undoubtedly subordinate to the irritation produced by the frequent washing and careless drying to which the legs of such horses are subjected; and on the whole the author's experience has not been such as to confirm the view that colour has much to do with the causation of, or liability to, disease in a general way.

The two most striking examples of the association of colour and disease are the melanotic tumors occurring under the tail in the region of the anus in grey horses and brown cattle, and the disease of the womb of white virgin heifers, called "white heifer disease," commonly met with in the hilly parts of Cumberland and the Lake district (England). These diseases are never found in animals of any other colour.

Attention is drawn by De Varigny, in his work on "Experimental Evolution," to the view that in albinos "absence of pigment and sterility are co-related expressions of the same constitutional change," and he also observes that "the cause which induces albinism generally affects the reproductive functions in a marked manner," partial or total sterility being induced.

Metschnikoff's investigations in regard to the function of white blood corpuscles in disease have led him to conclude that depigmentation of man's hair during advancing years is due to the destruction or eating up of the pigment by the white blood cells. If this be true, and if it be argued from it that all absence of pigment is due to invasion and attack of these living cells, it would appear that colour, or more correctly in this connexion, absence of colour or pigment, instead of being a predisposing cause of disease, as is generally held, is rather an effect of disease. This view is supported also by the whitening of the hair, which grows on surfaces previously the seat of saddle-galls and other sores on dark-coloured horses.

(*To be continued.*)

Supplementary List of Artificial Manures forwarded from time to time to the Chemist for Agriculture for Analysis, as required by Section 4 (Sub-sections 1 and 2) of the *Artificial Manures Act Amendment Act* 1905.

Supplementary Unit Values List, Season 1906.

Description of Manure.	Moisture. Per-cent-age.	Nitrogen. Per-cent-age.	Nitrogen. Estimated Value in One ton of the Manure.	Phosphoric Acid. Water Soluble. Per-cent-age.	Phosphoric Acid. Water Soluble. Estimated Value in One ton of the Manure.	Phosphoric Acid. Citrate Soluble. Per-cent-age.	Phosphoric Acid. Citrate Soluble. Estimated Value in One ton of the Manure.	Phosphoric Acid. Insoluble. Per-cent-age.	Phosphoric Acid. Insoluble. Estimated Value in One ton of the Manure.	Phosphoric Acid. Total. Per-cent-age.	Phosphoric Acid. Total. Estimated Value in One ton of the Manure.	Potash. Per-cent-age.	Potash. Estimated Value in One ton of the Manure.	Estimated Total Value of Manure per ton.	Price asked for Manure per ton Delivered at Local Railway Station.	Where Obtainable.
			£ s. d.		£ s. d.		£ s. d.		£ s. d.		£ s. d.		£ s. d.	£ s. d.	£ s. d.	
Blood Manure ..	27.34	7.01	3 17 1	..	..	..	..	..	..	1.18	0 3 6	1.28	0 7 0	4 7 7	4 10 0	City Council, Melbourne
Superphosphates (Hasell's Jap)	11.88	..	..	19.42	4 7 4	2.02	0 8 0	..	..	21.44	4 15 4	..	..	4 15 4	4 7 6	A. H. Hasell, Queen-street, Melbourne
Superphosphates ..	2.10	..	..	18.27	4 2 2	3.07	0 12 3	1.41	0 1 4	22.75	4 15 9	..	..	4 15 9	4 10 0	Wischer and Co., Market-street, Melbourne
Superphosphates (Special)	4.06	..	..	21.87	4 18 4	1.50	0 6 0	0.38	0 0 4	23.75	5 4 8	..	..	5 4 8	5 0 0	" "
Superphosphates ..	12.12	..	..	18.13	4 1 7	1.98	0 7 11	0.29	0 0 3	20.40	4 9 9	..	..	4 9 9	4 5 0	W. P. Shaw, Olderfleet, Melbourne
Guano	..	..	..	..	..	..	..	..	..	17.12	2 11 4	..	..	2 11 4	2 15 0	Wm. Holden, St. Leonards
Bonedust and Superphosphate	12.28	1.50	0 14 3	6.12	1 7 6	8.26	1 13 0	2.82	0 8 5	17.20	3 8 11	..	..	4 3 2	5 5 0	J. A. Dundas, Dynon-road, Melbourne
Grass Manure, Standard (Flag Brand)	7.62	0.98	0 9 3	12.88	2 17 11	3.58	0 14 3	0.56	0 1 8	17.02	3 13 10	0.94	0 5 2	4 8 3	5 0 0	Renard Fertilizer Co., Melbourne
Potato Manure, Standard (Flag Brand)	6.62	0.95	0 9 0	9.01	2 0 6	3.81	0 15 2	0.86	0 2 6	13.68	2 18 2	2.62	0 13 1	4 0 3	6 0 0	" "

SUPPLEMENTARY UNIT VALUES LIST, SEASON 1906—*continued.*

Description of Manure.	Moisture.	Nitrogen.		Phosphoric Acid.		Mechanical Condition.						Estimated total Value of Manure per ton.	Price asked for Manure per ton Delivered at Local Railway Station.	Where Obtainable.
								Nitrogen.		Phosphoric Acid.				
	Percentage.	Percentage.	Estimated Value in One ton of the Manure.	Percentage.	Estimated Value in One ton of the Manure.	Percentage of Fine Bone.	Percentage of Coarse Bone.	Percentage in Fine Bone.	Percentage in Coarse Bone.	Percentage in Fine Bone.	Percentage in Coarse Bone.			
			£ s. d.		£ s. d.							£ s. d.	£ s. d.	
Bonedust	6.16	3.10	1 11 1	19.60	3 4 6	37.00	63.00	1.14	1.96	5.75	13.85	4 15 7	5 10 0	J. A. Dundas, Dynon-road, Melbourne
"	10.76	2.40	1 3 10	16.25	2 16 11	57.47	42.53	0.73	1.67	8.24	8.01	4 0 9	5 0 0	G. Gardiner, Geelong
"	8.00	4.21	2 1 4	23.01	3 14 2	25.94	74.06	0.96	3.25	5.27	17.74	5 15 6	5 10 0	A. Day, Bendigo

SUPPLEMENTARY LIST SHOWING RESULTS OF ANALYSES OF SAMPLES OF ARTIFICIAL MANURES COLLECTED THROUGHOUT THE STATE UNDER THE PROVISIONS OF THE ARTIFICIAL MANURES ACT 1905.

Description of Manure.	Manufacturer or Importer.	Nitrogen.		Phosphoric Acid.		Mechanical Condition.				Estimated Value per Ton.
						Fine.		Coarse.		
		Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	£ s. d.
Bonedust, Special ..	Cuming, Smith, and Co., Melbourne ..	4.49	5.00	19.66	17.00	50.03	40.00	49.97	60.00	5 14 7
Bonedust	J. Cockbill, Melbourne	3.57	3.50	20.15	18.25	44.84	31.43	55.16	68.57	5 5 2
"	Kensington Manufacturing Co., Kensington	3.54	3.50	19.55	19.52	23.18	38.88	76.82	61.12	4 17 7
"	H. J. . ore and Co., Richmond ..	2.77	2.45	17.22	16.28	63.48	26.98	36.52	73.02	4 10 4
"	J. A. Dundas, Footscray	2.62	3.49	16.37	18.31	69.30	34.29	30.70	65.71	3 19 11
"	" " "	2.12	3.49	14.84	18.31	64.74	34.29	35.26	65.71	3 13 10

SUPPLEMENTARY LIST SHOWING RESULTS OF ANALYSES OF SAMPLES OF ARTIFICIAL MANURES—*continued.*

Description of Manure.	Manufacturer or Importer.	Nitrogen.		Phosphoric Acid.								Potash.		Estimated Value per Ton.
		Found.	Guaranteed.	Water Soluble.		Citrate Soluble.		Insoluble.		Total.		Found.	Guaranteed.	
				Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.			£ s. d.
Superphosphate, Florida ..	Cuming, Smith, and Co., Melbourne	..	..	17.84	18.00	2.11	1.50	.56	1.50	20.51	21.00	..	..	4 9 2
Sulphate of Ammonia ..	" " " "	19.68	20.00	..	..	..	..	..	..	..	..	..	..	14 2 0
Nitrate of Soda	" " " "	16.27	15.50	..	..	..	..	..	..	..	..	..	..	12 12 0
Thomas Phosphate ..	" " " "	..	..	..	..	13.29	12.00	2.92	3.75	16.21	15.75	..	..	3 1 11
Potato Manure	" " " "	1.28	1.06	7.66	8.21	5.67	3.63	7.43	5.53	20.76	17.37	6.26	5.20	6 6 11
Bonedust and Superphosphates	" " " "	1.72	1.50	6.50	7.50	8.12	5.00	5.46	8.50	20.08	21.00	..	..	4 15 8
Orchard Manure	" " " "	1.50	1.55	14.45	14.40	2.14	1.20	..	1.20	16.59	16.80	6.10	6.00	6 2 4
Superphosphate, No. 1 ..	Mt. Lyell M. and R. Coy., Melbourne	..	..	20.52	18.50	1.22	1.25	.96	1.00	22.70	20.75	..	..	4 18 1
" " ..	" " " "	..	..	20.65	18.50	.59	1.25	1.28	1.00	22.52	20.75	..	..	4 16 6
" " ..	" " " "	..	..	20.29	18.50	.93	1.25	1.33	1.00	22.55	20.75	..	..	4 16 2
Superphosphate, Special ..	Wischer and Co., Melbourne..	..	..	21.56	20.00	.13	1.00	1.11	1.00	22.80	22.00	..	..	4 18 7
" " ..	" " " ..	..	..	20.73	20.00	1.33	1.00	.39	1.00	22.45	22.00	..	..	4 18 10
" " ..	" " " ..	..	..	17.20	18.00	.93	1.50	2.02	1.50	20.15	21.00	..	..	4 3 0
Vegetable Manure ..	Renard Fertilizer Coy., Melbourne	1.86	1.25	6.66	9.30	5.91	3.40	1.95	..	14.52	12.70	2.65	2.50	4 12 10
Bonedust and Superphosphates	J. A. Dundas, Footscray ..	1.36	2.06	3.03	8.79	7.74	6.38	3.60	4.53	14.37	19.70	..	..	3 9 2
Blood Manure	" " " ..	9.90	7.15	..	..	..	..	..	..	..	..	..	..	5 8 11
Pea Manure	Sheaf Brand Manure Coy., Melbourne	..	..	10.59	13.00	2.98	1.00	..	..	13.57	14.00	2.50	2.40	3 13 2
Superphosphate, Anchor Brand, No. 1	Colonial Manures Coy., Melbourne	..	..	16.80	17.50	2.16	1.00	..	..	18.99	18.50	..	..	4 4 2
Star Phosphate, Anchor Brand	" " " "	..	..	..	..	13.55	14.00	7.25	3.00	20.80	17.00	..	..	3 15 11
Superphosphate, Anchor Brand	" " " "	..	..	16.87	17.50	1.50	1.00	..	..	18.37	18.50	..	..	4 1 10
Superphosphate	J. Cockbill, Post Office-place, Melbourne	..	..	15.87	17.11	2.87	1.90	..	..	18.74	19.01	..	..	4 2 9
Superphosphate, Standard Flag Brand	Renard Fertilizer Coy., Melbourne	..	..	16.02	17.00	3.73	1.50	.25	.50	20.00	19.00	..	..	4 7 3

W. PERCY WILKINSON,
Government Analyst for Victoria, and Acting Chemist for Agriculture.